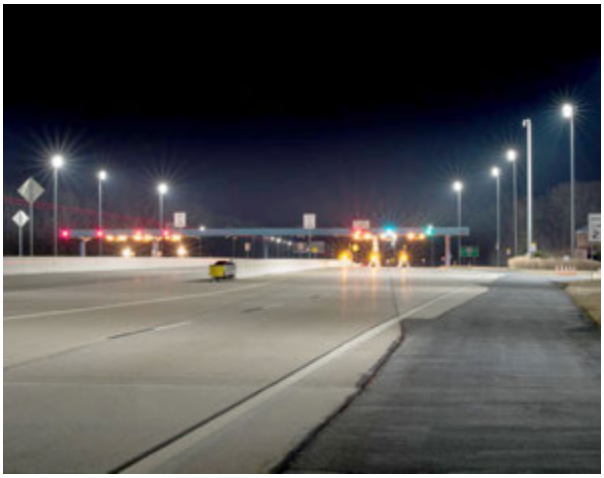

DELAWARE DEPARTMENT OF TRANSPORTATION'S

TRAFFIC LIGHTING POLICY

2020 Edition

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Submitted to:

DelDOT

Delaware Department of Transportation's Traffic Lighting Policy

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1. INTRODUCTION

Delaware Department of Transportation's Traffic Lighting Policy

Chapter 1 INTRODUCTION

The mission of the Delaware Department of Transportation (DelDOT) is to 'provide excellence in transportation for every trip made, by every mode of transportation, for every dollar spent, for everyone'. The Department strives to make sure every trip taken in Delaware is safe, reliable and convenient for people and commerce. It is important that safe options are provided for travelers in Delaware to access roads, buses, bike trails, walking paths, and all modes of transportation. This is done by seeking the best value for every dollar spent to benefit the customers and employees that utilize the services of the Department.

This Policy supports DelDOT's mission, and outlines the general practices, procedures and standards that govern roadway lighting designs for state-maintained roadways in Delaware. It is organized into six chapters as follows:

- **Chapter 1, Introduction** – an introduction to the purpose of roadway lighting, and a review of the basic information for roadway lighting designs
- **Chapter 2, The Lighting Plan Development and Deliverable Process** – reviews the process of performing a roadway lighting design, from initial request through installation of the design
- **Chapter 3, Lighting Warrants** – describes the DelDOT warrants for roadway lighting
- **Chapter 4, Lighting Requirements and Analysis** – provides guidance on determining the area of illumination, describes the process of performing lighting photometric calculations, and provides support on calculation criteria
- **Chapter 5, Lighting Design and Electrical Elements** – details the acceptable standards for the design elements of roadway lighting
- **Chapter 6, Electrical Utilities** – describes the design elements for utility owned lighting, and the coordination process with the local utility company for lighting projects

1.A Purpose of Roadway Lighting

The principal purpose of roadway lighting is to provide improved visibility for those traveling on roadways at night. Lighting can provide an additional level of comfort for a driver that sometimes cannot be achieved through the installation of raised pavement markers, pavement striping, roadway signing, or other effective passive methods. All customers that utilize the state-maintained roadway network system in Delaware, including drivers, pedestrians and bicyclists, can benefit from improved visibility in night-time conditions.

Although roadway lighting can be beneficial, there are negative aspects to providing roadway lighting. Even though DelDOT has standards in place for developing roadway lighting designs that limit light pollution, artificial light produced by roadway lighting does contribute to the night sky glow and reduces dark sky. There are also significant costs associated with providing a roadway lighting system owned by DelDOT, including construction costs for the installation, maintenance costs for both staff and equipment, and on-going electrical costs for the energy usage. For roadway lights mounted on utility poles, which are installed, owned and maintained by utility companies, DelDOT is responsible to pay a monthly tariff fee to the utility company for the cost of the fixture. Other concerns DelDOT has with installing roadway lighting is having enough staff available to maintain the lighting systems throughout the state. Also, although every effort is made to design and install roadway lighting that is considerate of errant drivers, any equipment installed along a roadway is a potential roadside hazard.

In the interest of being conservative with electrical and equipment costs, as well as taking into consideration DelDOT's maintenance capabilities, it is not realistic to install roadway lighting for every roadway in Delaware. Roadway lighting is also regulated by Delaware's State Code, Title 7, Chapter 71A (Regulation of Outdoor Lighting). A copy of Title 7 can be accessed at the following location: http://delcode.delaware.gov/title7/index.shtml. This Policy supports the regulations for roadway lighting established in Title 7, and provides additional guidance for designers to develop lighting systems that increase the potential safety of travelers on state-maintained roadways.

DelDOT will only install, maintain and fund lighting along state-maintained roadways to provide a safer facility for all road users including pedestrians, bicyclists, and transit users. Lighting for any purpose other than traffic safety, such as crime prevention, could be considered only if the design was completed to DelDOT standards, and another entity agrees to fund the construction and utility costs, as well as the on-going maintenance of the system. See **Appendix B** for additional information on DelDOT's funding of lighting projects.

1.B Design Objectives

The main objectives when performing a roadway lighting design is to provide a lighting system that:

- Meets DelDOT's required lighting design values
- Meets DelDOT's required uniformity ratio values
- Helps drivers on state-maintained roadways by providing safe travel pathways
- Supports the needs of pedestrians utilizing the state-maintained roadway network
- Provides cost effective transportation infrastructure
- Effectively minimizes environmental impacts
- Meets all electrical safety standards
- Controls the intrusion of light outside the intended design area
- Controls source glare by the design and/or the placement of the luminaires
- Maintains the clear zone by using only shielded or breakaway devices therein
- Minimizes the number of poles or other equipment that has a reasonable expectation of being struck by an errant road user

1.C Design Rules

To help facilitate good design practice, DelDOT has adopted Design Rules as stated in this Policy to ensure that the Design Goal is fully considered during the design and implementation of every roadway lighting system.

The establishment of target design values is necessary to provide appropriate and consistent levels of illumination on state-maintained roadways. The DelDOT accepted method for lighting analysis shall be the illuminance method, which will help the Department to provide consistent and thorough lighting reviews. The designer should refer to **Table 7** (in **Chapter 4**) as a guideline for standard illuminance levels and uniformity ratio values.

1.D Roles and Responsibilities

Many sections of DelDOT and other outside organizations contribute to the planning, design, construction, operations and maintenance of roadway lighting systems in Delaware. Information on the

roles and responsibilities of these stakeholders with regards to lighting designs can be found in **Appendix C**.

1.E Project Types

Lighting projects can generally be classified into one of four (4) types. The project type will determine the design process of the project, which has been described in more detail in Chapter 2 of this Policy. In general, the four lighting project types are:

Table 1 – Typical Lighting Project Types

Type A	Capital Projects
Type B	Traffic Lead Projects (Major)
Type C	Traffic Lead Projects (Minor)
Type D	All Other Projects

Capital Projects (Type A):

- Typically, led by DelDOT's Department of Transportation Solutions or Department of Planning.
- DelDOT's Traffic Section serves in a support role. Traffic Systems Design Section (or consultant representative) prepares the lighting design plans and supporting documents.
- Project types include:
  - New roadways
  - Corridor improvements
  - Sidewalk/multi-use paths
  - Bridge improvements
  - HEP Projects
  - TE Projects
  - Ped Audits
  - Other capital improvements

Traffic Lead Projects – Major (Type B):

- Typically, led and coordinated by DelDOT's Traffic Section.
- Supported by groups outside of the Traffic Section, as needed.
- Project aspects classifying it as 'Type B' include:
  - Lighting extending beyond the limits of an intersection
  - Installation of one or more lighting cabinet with multiple circuits
  - Significant coordination with local utilities
  - Designs requiring special details

Traffic Lead Projects – Minor (Type C):

- Typically, led and coordinated by DelDOT's Traffic Section.
- DelDOT Traffic Systems Design Group will typically prepare lighting plans.
- Support from groups outside of the Traffic Section is rarely needed.
- Project aspects classifying it as 'Type C' include:
  - Tariff only lighting designs
  - Lighting within the limits of an intersection only
  - Installation of a single lighting cabinet

All Other Projects (Type D):

- Typically, led by an agency outside of DelDOT (i.e. developers, Home Owners Associations, municipalities, towns, utility companies, legislator funded projects, etc.).
- DelDOT Traffic Systems Design Group serves in a review capacity only.
- Additional support provided as directed by the Chief of Traffic Engineering or designee.

Lighting upgrades may also originate through maintenance efforts. When existing lighting fixtures that do not meet current DelDOT standards are being retrofitted, DelDOT's Memorandum: 'Guidance on Retrofitting Existing HPS Lighting Fixtures with LED Equivalents' shall be followed so acceptable equivalent LED fixtures are installed. See **Appendix D** for a copy of this memo. If a maintenance effort includes the relocation of existing lighting, or installation of new lighting equipment, the project would be treated as a Type B or Type C, as applicable. In these situations, a photometric analysis and a lighting design would be required to determine optimized light fixture spacing and photometric values.

1.F Definitions

The following definitions are for terms used in this Policy:

High Pressure Sodium (HPS): A type of lighting fixture that works by creating an electric arc through vaporized sodium metal. HPS fixtures have historically been the most common roadway lighting fixture.

Illuminance: Amount of light that falls onto a surface. Measured in lumens per square foot, aka. foot-candles (fc).

Lateral Light Distribution: The predetermined pattern of light that is emitted by a luminaire onto a level surface.

Light-Emitting Diode (LED): A type of lighting fixture that contains electric components that emit light when electric current flows through them. LED fixtures are currently a popular choice for roadway lighting, due to their high efficiency.

Luminaire: Another term for a complete light fixture.

Luminance: Amount of light that reflects off or is emitted from a surface in a certain direction. Measured in candelas per square meter (cd/m^2).

Photometric Calculations: Calculations that are performed to measure and test the amount of light that is emitted by using predetermined fixture locations.

Uniformity Ratio (average/minimum): The ratio of the average illuminance value of all points in a specified area, to the darkest lit points in the same specified area.

Utility Clearance: The standard distance that must be maintained between any lighting equipment and any utility.

Vendor: A company that manufactures and sells roadway lighting fixtures.

Vertical Light Distribution: The predetermined amount of light that is distributed at measured vertical angles from the luminaire.

Warrant: Validation that the addition of lighting would be beneficial in specific situations.

1.G Referenced Publications

The following publications and supporting documents are referenced in this Policy:

- AASHTO's *Roadside Design Guide*
- AASHTO's *Roadway Lighting Design Guide*
- Delaware's *State Code, Title 7, Chapter 71A*
- DelDOT's *Design Resource Center*
- DelDOT's *Functional Classification Maps*
- DelDOT's *Pedestrian Accessibility Standards (PAS) for Facilities in the Public Right-of-Way*
- DelDOT's *Road Design Manual*
- DelDOT's *Standard Specifications*
- DelDOT's *Standard Construction Details*
- DelDOT's *Traffic Design Manual*
- NFPA 70 *National Electrical Code (NEC)*
- IESNA's *Lighting for Parking Facilities (RP-20-14)*
- IESNA's *Roadway Lighting (RP-8-14)*
- IESNA's *Tunnel Lighting (RP-22-11)*
- IEEE's *National Electrical Safety Code*

1.H DelDOT Traffic Lighting Policy Updates

The information contained in this policy document is current at the time of publishing. It is expected that the guidance contained in this document may be updated periodically. Interim guidance may be published by DelDOT and will be made available on DelDOT's website within the Design Resource Center (DRC). Proposed changes to this policy document should be suggested using the Traffic Systems Design Directive form found in **Appendix A**, and must be approved by DelDOT's Chief of Traffic Engineering.

2. THE LIGHTING PLAN DEVELOPMENT AND DELIVERABLE PROCESS

Chapter 2 THE LIGHTING PLAN DEVELOPMENT AND DELIVERABLE PROCESS

This chapter of DelDOT's Traffic Lighting Policy describes the recommended process of performing a lighting design, from the initial request through installation of the design. Details of this process may vary with any design but should be followed to support engineers in developing lighting designs that conform to the Department's policies.

2.A Project Initiation

The lighting design process can begin in a variety of ways, including a request to install or modify existing lighting. A roadway design project could also trigger an evaluation of existing or proposed roadway lighting. The results of a study could include potential lighting improvements. Based on the project, the size of a roadway lighting design could range drastically, from lighting a single intersection, to lighting an entire interchange, or a lengthy roadway segment.

2.B Establish Need for Lighting

DelDOT Traffic's responsibility is limited to roadway lighting along state-maintained roadways, outside of subdivisions, and within DelDOT's Right of Way. If all of these conditions are not satisfied for a lighting project, then no further action is required by the DelDOT Traffic Systems Design Group (i.e. Traffic Design Group) or the DelDOT Traffic Studies Group (i.e. Traffic Studies Group). If a lighting project meets all of these conditions, then a need for lighting must be established prior to beginning a lighting design.

This Policy has developed standard warrants to provide a methodology for approving and installing lighting throughout the State. A need for lighting could also be determined by a traffic engineering study, the Traffic Studies Group, or the DelDOT HSIP/Design Resource Group. In all cases, the installation of lighting or the continuation of lighting depends on the availability of authorized funds for this purpose. For information on determining if lighting is warranted for a project, and supporting information, see **Chapter 3**.

If lighting is warranted, the designer should determine the area of the project that will require illumination. The lighting area will differ for every project, but this Policy has provided guidance to help determine the extent of lighting that will be needed based on certain geometric characteristics and roadway features. For additional information on determining the areas of illumination for a lighting design, see **Chapter 4**.

If lighting is not warranted, DelDOT will not prepare a lighting design. The findings should be shared with the original requestor, then documented and filed for future reference. In certain cases, funding from sources outside of the Department may still support a lighting installation along a DelDOT owned roadway even if lighting is not warranted by DelDOT. In these cases, the party that is pursuing lighting installation shall follow the standard processes described in this Policy to develop a lighting design that meets DelDOT standards. The outside party should submit the lighting design to DelDOT for review and conformity.

2.C Project Coordination

2.C.1 Agency Coordination

Prior to completing a design, the engineer should obtain from the Department any existing information on record pertaining to the project, including existing plans, as available. On-going coordination with those involved in the design will be needed throughout the life of the project. In general, the project type determines the deliverables that are required and the job expectations of those involved.

Type A (Capital Projects):

- Designer completes lighting work as a portion of a larger project
- If study performed before design initiation and lighting was recommended, designer should request:
  - Copy of the study
  - Crash diagram showing the general area of concern
  - Other pertinent data
- Designer completes warrant evaluation for lighting to determine if lighting is warranted
- Designer obtains additional data for existing, proposed or modified lighting conditions
- Designer determines extent of lighting design
- Designer coordinates with Project Manager and others who have a specific interest in the project

Type B / C (Traffic Lead Projects – Major or Minor):

- Designer completes lighting work as the primary purpose of project
- If Traffic Studies Group initiated project, at beginning of design process they shall provide designer:
  - Copy of study
  - Crash diagram showing the general area of concern
  - Other pertinent data
- Designer completes warrant evaluation for lighting, if not already completed by Traffic Studies
- Designer should obtain additional data for existing, proposed or modified lighting conditions
- Designer will work with Studies, to finalize limits of lighting improvements
- Designer coordinates with Project Manager and others who have a specific interest in the project

Type D (All Other Projects):

- Design and study typically led and completed by agency outside of DelDOT (i.e. developers, Homeowners Associations, municipalities, towns, utility companies, legislator funded projects, etc.)
- Traffic Design Group will review design if lighting is along a state-maintained roadway

2.C.2 External Coordination

Coordination with the local electric utility company should be initiated as early in the design process as possible. The designer is responsible to coordinate with the local utility company regarding power sources and utility pole mounted (tariff) lighting. See **Chapter 6** for additional information regarding utility coordination.

If the project is located near an airport, port facility, railroad or air base, additional coordination with the appropriate agencies (Federal Aviation Administration (FAA), CSX, etc.) will likely be required.

2.D Submission Requirements

In general, the project type determines the deliverables that are required and the job expectations of those involved.

Table 2 summarizes the deliverable requirements for each project type submission:

Table 2 - Lighting Project Deliverable Requirements

	Preliminary	Semi-Final	Final	PS&E or Handoff
Project Type A – Capital Projects	○ Preliminary Plans ○ Draft Lighting Design Report	○ Semi-Final Plans ○ Voltage Drop Calculations ○ Conduit Fill Calculations ○ Details ○ Cost Estimate ○ Revised Lighting Design Report & Photometric Figure	○ Final Plans ○ Revised Voltage Drop Calculations ○ Revised Conduit Fill Calculations ○ Revised Details ○ Revised Cost Estimate ○ Revised Lighting Design Report & Photometric Figure ○ Special Provisions (as necessary)	○ PS&E Plans ○ Revised Voltage Drop Calculations ○ Revised Conduit Fill Calculations ○ Revised Details ○ Revised Cost Estimate ○ Revised Lighting Design Report & Photometric Figure ○ Revised Special Provisions (as necessary)
Project Type B – Traffic Lead Projects (Major)	○ Draft Lighting Design Report	○ Semi-Final Plans ○ Voltage Drop Calculations ○ Conduit Fill Calculations ○ Details ○ Cost Estimate ○ Revised Lighting Design Report & Photometric Figure	○ Final Plans ○ Revised Voltage Drop Calculations ○ Revised Conduit Fill Calculations ○ Revised Details ○ Revised Cost Estimate ○ Revised Lighting Design Report & Photometric Figure ○ Special Provisions (as necessary)	○ Signed Plans ○ Revised Voltage Drop Calculations ○ Revised Conduit Fill Calculations ○ Revised Details ○ Revised Cost Estimate ○ Revised Lighting Design Report & Photometric Figure ○ Revised Special Provisions (as necessary) ○ Handoff Package
Project Type C – Traffic Lead Projects (Minor)	N/A	○ Semi-Final Plans ○ Voltage Drop Calculations ○ Conduit Fill Calculations ○ Cost Estimate ○ Lighting Design Report & Photometric Figure	N/A	○ Signed Plans ○ Revised Voltage Drop Calculations ○ Revised Conduit Fill Calculations ○ Revised Cost Estimate ○ Revised Lighting Design Report & Photometric Figure ○ Handoff Package
Project Type D – All Other Projects	No Formal Submission Process -Designer should support project as per direction from Chief of Traffic Engineering or designee.			

2.E Development of Plans and Deliverables

The preparation of the design plans is one of the most important aspects of a lighting project. The lighting plans convey a detailed method for both the installation and maintenance of the lighting system. It is paramount that the designer communicates the design aspects in a clear, concise, correct, and thorough manner. The roadway lighting plans may be a supplemental part of a larger construction plan set (Project Type A), or they may constitute a complete set of standalone plans (Project Types B / C / D). This Chapter provides information on the lighting design deliverables. Additional information on features to be included in the lighting plans can be found in **Appendix E**.

Lighting plans should be developed for every lighting design completed along a state-maintained roadway. Plan sheets depict how the proposed lighting system should be installed and provide detailed information to help M&O better maintain the system in the future. Plan sheets generally show both existing and proposed geometric features of the roadway and lighting equipment and identify the proposed power source. Other important information typically included are specific directions on how to install the system, including structural and electrical details.

Lighting plans should be oriented to show the major roadway running left to right, unless they are included in a larger plan set that dictates otherwise. All fonts, symbols, the title block, and the border should be in accordance with DelDOT's latest CADD standards. These standards can be found at the Design Resource Center on the Delaware Department of Transportation's website, at www.deldot.gov. Files at this location include cell libraries, seed files, font styles, line styles, etc. Microstation should be used to prepare all lighting design plans. For a checklist of items to be shown on a lighting plan, see **Appendix E.** For samples of plan sheets, see **Appendix F** through **Appendix J**.

Title sheets may be required for lighting designs and will be included at the direction of the DelDOT Traffic Section, as necessary. Title sheets identify the location of the project and the limits of work on a location map. The project title and the index of sheets are also included on the title sheet. Signature blocks shall be shown, with spaces provided for the Chief of Traffic Engineering approval and the Designer. The Designer shall also stamp the title sheet. Contract numbers shall be provided for DelDOT or Federal-aid projects, as applicable. An example of the standard lighting title sheet can be found in **Appendix F**.

2.E.1 Prepare Base Plans

The designer should collect any available data or information on their project location and the equipment therein to develop base plans. This includes locating any 'as-built' plans, whether it be for traffic equipment, highway design, utilities, etc. Existing right-of-way information is also extremely important, and can be determined by utilizing existing plans, pulling any plats, or performing necessary research with the local municipality to locate deeds. Additionally, since all lighting equipment should be installed outside the clear zone, it is important to designate the clear zone on the base plans. All information will help the designer develop thorough lighting designs. The lighting designer is responsible to locate and review the available information before performing any aspects of design.

Once the preliminary data has been collected and reviewed, the lighting designer can set up the base plan. A CADD version of a base plan should be prepared for every lighting design. All base plans should follow DelDOT's CADD Standards. Base plans should be developed at a scale of 1 inch = 30 feet and typically show existing and proposed roadway geometrics, utilities, right-of-way, drainage, and clear

zone, as well as any physical features that could affect the design of the lighting system. All existing traffic equipment, including lighting features, signals, and ITS devices, as well as the final striping condition of the roadway should be shown. In addition, any proposed traffic equipment that may have any potential conflicts with the lighting design should be verified.

The information to be shown on a base plan can be displayed using different methods. For more simple lighting designs, an aerial background, in combination with measurements and information gathered during the site visit, can be used to display the features. For more complicated designs involving roadway reconstruction, or if utility, right of way, geometric, or other required information is indeterminable, a full survey may be required. Depending on the scope of the lighting project, surveying could include: instrumental field work, deed research and Right-of-Way establishment, as well as locating underground and aerial utilities based on field data and utility company information. When a survey is available, it should be utilized to prepare the lighting base plans. The lighting designer is still responsible to perform their own site visit to verify the features of a survey.

A detailed list of base plan features is included in **Table 3** below.

Table 3 – Typical Lighting Base Plan Features

- Surveyed topography
- Ultimate locations of building lines, fences, trees, shrubs, etc.
- Right-of-way (existing and proposed)
- Limit of construction
- Clear zone
- Proposed baseline
- Road name labels
- Ultimate physical features (curb and gutter, islands, sidewalks, medians, shoulders, drainage structures, guardrail)
- Ultimate locations of all utility equipment (poles, manholes, underground conduits and pipes, overhead aerial lines, etc.)
- Location of existing lighting equipment (poles, controller cabinet, junction wells, etc.)
- Ultimate locations of all traffic equipment, as necessary
- Ultimate striping condition
- Ultimate structure locations
- Bus stops and loading zones

It is imperative that the information displayed in the base plan convey the actual field conditions. The lighting designer is responsible to complete a thorough in-person inventory / assessment of the project site to determine the current conditions. The designer is responsible for collecting information on existing overhead and underground utilities, and equipment that could interfere with a lighting design. If an existing lighting system is present within the project limits, the designer should verify all equipment included in the lighting system. If any field issues/irregularities are discovered, the designer should report them to the appropriate districts in the Department.

Information that should be collected, or verified, during the site visit is included in **Table 4** below.

Table 4 – Typical Site Visit Verification Checklist

- Existing lighting equipment locations (cabinets, junction wells, poles, etc.)
- Existing lighting power sources
- Existing light fixture information (wattages, fixture type, etc.)
- Conflicts between existing lighting and utilities
- Utility pole locations and overhead line heights
- Other utility features
- Potential electrical service sources
- Potential light pole and cabinet locations
- Locations of drainage features
- Pavement markings
- Sidewalks and handicap ramps
- Guardrail locations
- Existing off-road lighting (i.e. – private lighting, etc.)
- Trees and vegetation
- Important roadway features (edge of pavement, driveways, entrances, etc.)
- Nearby structures and heights (buildings, bridges, sign structures, etc.)
- Potential safety impacts
- Existing transit stops
- Intersection information (signalized, unsignalized, etc.)
- Surrounding land use information
- Speed limit of roadway
- Site distance obstructions

2.E.2 Preliminary Submission

2.E.2.a Preliminary Design Plans

Once a base plan has been developed, the preliminary plan sheets should be created to better display the design. These sheets will be used to define the area of the project that requires illumination. The illuminance levels for the design should be shown on the preliminary plan sheets. The area of lighting should be shaded on the plans and submitted to the Traffic Design Group as part of the preliminary submission.

Information to be shown on the preliminary design plans include:

- Information from the base plans
- Locations and identification of existing lighting equipment
- Proposed geometric condition of the roadway
- Proposed striping condition of the roadway
- Proposed area of illumination
- Required illuminance values

Additional information may be necessary on the preliminary plans, depending on the project scope. If the project has specific design concerns, they should be shared with Traffic Design Group when the preliminary plans are submitted for review. The Traffic Design Group will review the preliminary plans and provide feedback to the designer. If a meeting is necessary to discuss the design, then the Traffic Design Group will contact the designer. This will be completed prior to the designer beginning the

photometric analysis. If a lighting project is Type B/C, then the preliminary plans may not be necessary, based on coordination with the Traffic Design Group.

2.E.2.b Area of Illumination

For the preliminary submission, the designer should show the proposed area of illumination for the project as a shaded area on the plans. At this point, the required illuminance levels for the project area can be determined. Levels of illuminance are developed for roadway lighting in Delaware, based on AASHTO guidelines. Additional information on the process of determining lighting levels can be found in **Chapter 4**.

Some projects may require different levels of illuminance be provided at different locations of the project area based on geometric conditions. In these situations, a different color of shading should be used for each illuminance level. Tables should also be provided on the plans that report the following requirements for each area to be lit:

- Roadway Classification
- Area Classification
- Average Maintained Illuminance
- Minimum Illuminance
- Illuminance Uniformity Ratio

The Traffic Design Group will review the area of illuminance and required illuminance levels and will provide feedback as necessary. Once the area of illuminance and required illuminance levels are approved, the designer can then complete the lighting analysis.

2.E.2.c Lighting Design Report

A summary of the project information shall be prepared for each DelDOT roadway lighting design. The designer is encouraged to utilize the Lighting Design Report provided in **Appendix K** to summarize their project information in a standard format. This report provides the reviewer a better understanding of the project by supplying the background information. It is also beneficial to the lighting designer to have documentation of the design decisions and information for their project. In lieu of reporting the calculated photometric values on the Lighting Design Report, the designer can instead output the results directly from their photometric file.

For Type A and Type B projects, a draft of the Report should be included with the preliminary submission. The following sections of the Report should be completed with this draft:

- General Project Information
- Existing Lighting
- Design Values: Roadways (recommended values)
- Design Values: Intersections (recommended values)
- Proposed Lighting Equipment

Although photometric calculations are not completed before the preliminary submission, the designer should think through potential aspects of the proposed lighting design when completing the draft Report. At this time, the designer should consider whether the proposed lighting will be tariff/utility owned (preferred), DelDOT owned, or a combination of both. If the lighting design will include DelDOT

owned poles, then the designer should consider the potential power sources. After the draft Report is submitted with the preliminary submission, the Traffic Design Group will contact the designer with any concerns. The designer should then revise the information in the Report as necessary and complete the remaining information for the semi-final submission. A figure displaying the photometric design should also be included with the fully completed Lighting Design Report during the semi-final submission.

For Type C projects, the fully completed Lighting Design Report and photometric figure should be submitted together during the semi-final submission. See section 2.E.3.a.i for more information on the photometric figure.

2.E.3 Semi-Final Submission

As part of the semi-final submission, the designer should submit the plans and deliverables to both the Traffic Design Group and the local Maintenance and Operations (M&O) district for review. Feedback via email is sufficient for M&O reviews.

2.E.3.a Photometric Analysis

Once the Traffic Design Group approves the lighting levels for the project, the designer can complete the photometric calculations. Photometric calculations should be performed for all proposed roadway lighting designs. The photometric analysis needs to be completed at the beginning of the semi-final design. These calculations are necessary to determine if a lighting design meets the requirements and are typically performed by commercially-available lighting design software programs. The lighting designer should utilize the previously prepared base plan to set up the photometric calculation file. Refer to **Chapter 4** for more detailed information on performing a lighting analysis.

Lighting fixtures that meet DelDOT's luminaire criteria should be used to complete photometric calculations for DelDOT owned lighting designs. See **Chapter 4** for additional information on DelDOT's lighting fixture criteria. To find a luminaire suitable for their project, the designer may coordinate with a lighting vendor. Typically, lighting vendors keep product information, pictures and specifications of the various fixtures they stock on their website. The designer shall review all the information provided in detail to ensure a fixture is selected that meets DelDOT's criteria. For utility owned lighting designs, the designer shall coordinate with the local utility company to determine what fixtures are currently stocked.

Once the designer selects a fixture, they will download the fixture's .ies file and use it to perform photometric calculations. The designer can also contact the utility company to obtain the .ies file for their preferred fixtures. An .ies file is a text file provided by a lighting vendor which can be uploaded into lighting design software and represents the typical amount of light a luminaire produces. If the desired .ies file is not available on the vendor's website, the designer can contact the vendor directly to obtain the file. The designer shall calculate a light loss factor for each fixture by using the vendor's information. The calculated light loss factor is necessary to complete photometric calculations. For additional information on how to calculate a light loss factor, see **Chapter 4**.

For DelDOT owned lighting designs, determining acceptable locations for proposed light poles is one of the most important aspects of the lighting design. There are many factors to consider when determining light pole locations, including the base plan information, as well as geometric conditions such as slope of the ground, and drainage issues. For additional information on the proper placement of light fixtures,

see **Chapter 4**. For utility owned lighting designs, the designer must identify the locations of existing utility poles suitable to mount lighting fixtures. For additional information on utility owned lighting designs, see **Chapter 6**.

The photometric calculations and the .ies files shall be submitted to the Traffic Design Group for review with the semi-final submission. Both the electronic version of the photometric calculations, as well as a summary figure, should be included. Once the photometrics are complete and the designer is comfortable with the lighting fixture and pole layout, this information should be added to the plans.

It is possible that aspects of the design could change in following phases. The lighting analysis shall be updated as necessary to verify that the light locations work with the current version of the project. For design updates that require minor relocations of a lighting pole, engineering judgement must be used to determine if the photometric files need to be recalculated and resubmitted to DelDOT for review. In general, if a light pole is being relocated within a five-foot radius of its previous location, then a new photometric analysis should not be needed.

2.E.3.a.i Photometric Figure

A photometric figure shall be developed and included as part of the information for the Lighting Design Report. This figure will provide an overview of the final photometric calculations for the project. Information that should be provided on the figure include:

- Base Plan
- Final Geometric Conditions
- Final Striping Layout
- Final Utilities
- Proposed Pole Locations
- Areas of Illuminance
- Photometric Calculation Results Reported for all Illuminance Areas, including:
  - Average Maintained Illuminance
  - Minimum Illuminance
  - Illuminance Uniformity Ratio

For Type A and Type B projects, this figure should be added to the fully completed Lighting Design Report after the photometric calculations are performed and included with the Semi-Final submission. For Type C projects, this figure should be submitted with the fully completed Lighting Design Report during Semi-Final.

A sample Lighting Design Report Figure is provided with this Policy, and can be found in **Appendix L**.

2.E.3.b Semi-Final Design Plans

The development of the semi-final lighting plans is when most of the design elements are added to the plan set. If the lighting plans were originally developed as part of the preliminary submission, then the shaded area of illumination can be removed for the semi-final plans. If the designer received comments from the preliminary submission, those comments should be addressed as part of the semi-final lighting design. The semi-final plans should include as much information for the lighting design as the designer is

able to provide. It is possible that some elements of the design might not be able to be completed until a later submission, but the designer should make every effort to provide a thorough design.

Information that needs to be shown on the semi-final design plans includes equipment locations, which is achieved by adding graphical symbols to the plans. Detailed equipment information should be included, which is reported in schedules on the plan sheets. Project specific notes should be included for installations that might require more detailed descriptions.

Proposed equipment that needs to be shown on the semi-final design plans includes:

- Luminaire Locations
- Pole Locations
- Conduit and Junction Well Locations (DelDOT owned lighting projects only)
- Cabinet Locations (DelDOT owned lighting projects only)
- Power Feed Locations (DelDOT owned lighting projects only)
- Service Meter Disconnect Locations (DelDOT owned lighting projects only)
- Transformer Locations (DelDOT owned lighting projects only)
- Equipment to be Removed or Salvaged

Information to be reported in schedules on the semi-final design plans includes:

- Lighting Standard Schedule
  - Pole Number and Location
  - Pole Height and Type
  - Arm Length
  - Luminaire Information
  - Pole Base Type (DelDOT owned lighting projects only)
  - Circuit Number (DelDOT owned lighting projects only)
  - Latitude and Longitude Coordinates of Pole (DelDOT owned lighting projects only)
- Lighting Service Schedule (DelDOT owned lighting projects only)
  - Conduit Run Number
  - Number and Type of Conduits
  - Conduit Size
  - Conduit Length
  - Method of Conduit Installation (Boring, Trench, Open-Cut)
  - Amount and Size of Cable/Wire
- Power Source Schedule (DelDOT owned lighting projects only)
  - Power Provider
  - Location of Power Source
  - Type of Power Source
  - Voltage
  - Location of Cabinet
  - Size of Cabinet
  - Power source display map where appropriate

For additional information on the different elements of lighting design, see **Chapter 5**.

2.E.3.c Utility Coordination

Coordination with the local utility company should be completed as early in the design phase as possible. This coordination is needed to determine potential power source options, to relocate existing power sources, as well as to verify whether it is feasible to mount lighting fixtures on utility poles (DelDOT's preferred option for roadway lighting), or to confirm whether utility clearances are acceptable. Coordination with the utility company should also help the designer determine the optimal location and size of the lighting cabinet. Information on what needs to be shared with the utility company, as well as an overview of the coordination process, can be found in **Chapter 6**.

2.E.3.d Conduit Design and Fill Calculations

After the locations of the lighting equipment are determined, the designer can lay out the conduit design. The conduit will hold the power cables that run from the power source, to the cabinet, and then out to the poles. Conduit is typically installed in straight pathways, so junction wells should be utilized when the conduit system needs to change direction. For more information on conduit and junction wells for lighting designs, see **Chapter 5**.

The National Electric Code (NEC) sets limits on the cross-sectional area of a conduit that can be filled by cables. Conduit fill calculations shall be performed for every lighting design that includes the installation of conduit to determine the size of the conduit used to house the cables. For more information on conduit fill calculations see **Chapter 5**.

2.E.3.e Voltage Drop Calculations

Determining the correct size wiring to power the lighting equipment is another step in the design process. Making sure that the wiring is sized to support the lighting system is extremely important. If not done according to the NEC standards, then the lighting system may operate improperly due to voltage drop issues and could be extremely hazardous to anyone coming in contact with the system. The size of the wiring is determined by performing voltage drop calculations and meeting the minimum wire sizing mentioned in **Chapter 5**. Voltage drop calculations shall be performed for every lighting design that includes the installation of cable to ensure that the design conforms to the NEC standards. For more information on performing voltage drop calculations see **Chapter 5**.

2.E.3.f Circuit Diagrams

The designer shall provide the wiring layout for the lighting design. The designer should complete diagrams that display the circuit layout of the lighting equipment. Circuit diagrams are completed to clearly display the intended cable layout from the design plans. These diagrams help document the cable layout used for the voltage drop calculations, which determines the wiring sizes. They also assist the contractor in building a system that is appropriately sized for the design equipment. For more simple lighting projects, a circuit diagram might not be necessary. In these situations, a panel schedule could be provided in lieu of developing an entire circuit diagram. Examples of circuit diagrams and panel schedules are included in **Appendix M**.

2.E.3.g Details and General Notes

The DelDOT Standard Construction Details include details for some traffic and lighting equipment. If a piece of lighting equipment does not have a standard detail, but the designer feels that a detail is necessary to provide clear information to the contractor, then a detail should be developed and included with the plan set for additional clarification. All details shall follow the DelDOT Standard Specifications. Sample non-standard details for common lighting equipment can be found in **Appendix N**. The designer is responsible to review any details before using them in their design.

The designer shall include project specific notes on the plans as necessary to assist the contractor with constructing the lighting system. Common project specific notes for lighting designs include information on power source work, equipment to be removed, the maintenance and construction of the project, charging information for equipment or construction methods, or information on aspects of non-typical lighting designs.

2.E.3.h Cost Estimate

The designer shall generate a cost estimate for lighting work. Cost estimates should report the total estimated cost of work related to lighting and include a quantity breakdown of all items to be furnished and installed by the contractor and/or DelDOT forces to make sure the lighting system is fully operational. All items should be reported with their unit of measurement and their unit cost. DelDOT specifications shall be followed to determine quantities. The estimate should also include costs for Maintenance of Traffic, and relevant earthwork. The lighting designer shall verify accurate unit costs and a contingency reflective of current practices are used.

If the design includes luminaires installed on utility poles, the designer should request a cost estimate from the utility company for the construction costs associated with the utility pole-mounted luminaires. This should be completed prior to project handoff.

At the beginning of the project, it should be defined by DelDOT Traffic whether the construction of the project will be handled by a General Contractor (Project Type A) or by one of the Traffic Section's on-call Contractors (Project Type B or Type C). Lighting costs for Type A projects are included in the overall general bid of the project. For Type B or Type C projects, all quantities related to the lighting work, maintenance of traffic, or other supporting work, should be included in DelDOT's Traffic Project Spreadsheet (i.e. cost estimate). An example of lighting costs totaled in DelDOT's Traffic Project Spreadsheet is provided in **Appendix O**.

Depending on the project type, the cost estimate may need to be separated into different material lists:

Project Type A
Project Contractor Material List – Includes items to be furnished, installed and removed by the general Project Contractor. The designer shall prepare a list of the lighting quantities using the latest DelDOT Traffic Project Spreadsheet.

Project Types B / C
Traffic Open-End Contract Material List - Includes items to be furnished, installed and removed through the Traffic Section Open-End Construction Contract, or other Traffic Section forces. The designer shall prepare a cost estimate using the latest DelDOT Traffic Project Spreadsheet.

Project Type D
For these lighting projects, DelDOT would not have any involvement or responsibilities for any costs because these projects are designed and paid for by agencies outside of the department. Outside agencies would be responsible for any electrical service application and any associated costs as well.

2.E.3.i Technical Memorandums

The designer should make every effort to complete their lighting design to the standards established in this Policy. The Department recognizes that situations may arise that prevent the lighting design from meeting every requirement. In these situations, the designer will complete a Technical Memorandum to document a design that differs from the Department's standard. The Technical Memorandum should be completed and shared with the Traffic Design Group for review and comments when the designer realizes the need for the design change. Technical Memorandums shall be submitted prior to the PS&E submission for capital projects. A sample of a Lighting Technical Memorandum has been provided in **Appendix P**.

2.E.4 Final (PS&E) Submission

Depending on the Project Type, there could be both a Final Submission as well as a PS&E (Plans, Specifications, and Estimates) submission. If a Final Submission is included in the project scope, then this provides the designer an opportunity to address any comments received during the semi-final plan review and resubmit the lighting documents to the Traffic Design Group and the appropriate maintenance district for an additional round of reviews prior to completing the project design. When the lighting design is turned in for the PS&E submission, all comments that were received during previous review processes should have been addressed.

2.E.4.a Final (PS&E) Design Plans

Once the Traffic Design Group and the appropriate maintenance district have given the final approval of the lighting plans and project deliverables, the designer is responsible to obtain the necessary signatures. Depending on the project, signatures from different parties might be necessary.

Project Type A
The title sheet signatures shall suffice as the appropriate approval for the project, so no separate signatures are required. However, if the different sections of the project are designed by different entities who have individual responsibilities, then one set of the final lighting plans shall be signed by the appropriate Engineers.

Project Types B / C
For Traffic Lead or Traffic Support lighting projects, one set of the final lighting plans shall be signed by the appropriate Engineers. For projects that include a Title Sheet, the Designer shall sign and seal the Title Sheet, and then share the plans with the Chief of Traffic Engineering or designee for final approval and signature. For projects that do not include a Title Sheet, the Designer shall sign and seal the plan sheet, and then share the plans with the Chief of Traffic Engineering or designee for final approval and/or signature.

The signed version of the plans should be included with the PS&E deliverables. For examples of different types of lighting plans, see **Appendix G** through **Appendix J**.

2.E.4.b Specifications

Standard specifications have been adopted by DelDOT. Special provisions are required if a non-standard item is included in a project. Non-standard items should be avoided whenever possible.

2.E.4.c Project Handoff

Once the plans are signed and approved, the lighting designer shall submit the handoff package to Signal Construction, as well as any other groups involved with construction of the project. The handoff process is only required for Type B and Type C (Traffic Lead) projects. For Type A (Capital) projects, the PS&E submission is sufficient. Type D projects do not require any kind of handoff process. For developers' projects, the lighting plans should be a part of the entrance plans.

Items to be included in a handoff package and submitted to the Signal Construction Group:

- Traffic Systems Design Handoff Form
- Copy of the approved plan(s)
- Cost Estimate
- Funding Approval
- Environmental Clearance (only if project is Federally funded)
- Work Hour Restrictions Checklist
- Draft Press Release
- Special Provisions (as necessary)
- Concurrence Form (as necessary)

Items to be submitted to Design to be saved in the project records:

- Lighting Design Report and Photometric Analysis Figure
- Voltage Drop Calculations
- Conduit Fill Calculations
- Project Specific Documents

Signal Construction will place the project on the construction schedule. For projects with a General Contractor, the Field Operations Manager will be responsible to place the project on the construction schedule, and to coordinate that information with the inspection staff. Once the project is on the schedule, orders should be placed for any equipment that needs to be manufactured in advance.

A draft press release shall be provided as part of the handoff package to the Signal Construction Group. However, as the process is subject to change the designer should coordinate with Traffic Design Group for any additional information. During the construction phase, the Signal Construction Group should keep Community Relations informed of all lane closures, operational changes, and new activations.

2.E.4.c.i Handoff Form

A handoff form will need to be completed by the designer and submitted to the Signal Construction Group. For Type B / C projects (Traffic Lead Projects), the Signal Construction Group controls the schedule. The Handoff Form should designate the priority of the project as "ASAP," "High," or "Normal", as appropriate. The anticipated start date should be noted on the handoff form. A copy of the handoff

form is provided in **Appendix Q**. A handoff form is not necessary for Type A projects, as all lighting equipment will be installed by the Project Contractor, who will follow the overall project's schedule. A handoff form is also not needed for Type D projects.

2.E.4.c.ii Concurrence Form

For Type B/C projects, a concurrence form should be completed by the designer and submitted with the final plan for approval. The designer needs to have information on the Right-of-Way impacts to the project, environmental clearance, utility coordination information, and railroad coordination information to complete the form. A copy of the concurrence form is provided in **Appendix R**.

2.E.4.c.iii Environmental Clearance

The Traffic Design Group will need to obtain environmental clearance for Federally Funded projects prior to handoff to Construction. Information that the designer needs to provide when submitting for environmental clearance includes: project number, general project location with aerial view of the site, justification of the project, and a description of the work proposed outside the Right-of-Way. The Traffic Design Group will include this information in an email to DelDOT's Environmental Stewardship group for approval. Once the Traffic Design Group receives approval, a copy of the email should be submitted with the Handoff Package as proof of environmental clearance. An example of the environmental clearance coordination can be found in **Appendix S**.

2.E.4.c.iv Work Hour Restrictions Checklist

The designer will need to complete a Work Hour Restrictions Checklist to be included with the Handoff Package. There are two checklists that a designer could use, one for Open-Ended Contracts and one for all other contracts. The completed Checklist must be submitted to Safety, along with a copy of the completed plans, for approval. Once Safety approves the Checklist, the designer will then share it with Community Relations for signature. Once all signatures are obtained, the Checklist will be submitted as part of the Handoff Package to Construction. Copies of the Work Hour Restriction Checklists are provided in **Appendix T**.

2.E.4.c.v Funding Approval

For types B/C projects, it is the designer's responsibility to coordinate with the Traffic Design Group regarding funding approval for the project. The designer shall provide cost estimates, and additional information as necessary, to the Traffic Design Group in order to obtain funding approval. Once funding has been granted, the Traffic Design Group will include any formal approval paperwork as part of the Handoff Package.

2.F Construction and Implementation

Depending on the type of project, certain steps must be taken to handle the construction and implementation of the design.

Project Type A

The project documents shall be kept on file by the DelDOT Traffic Section. The Designer should share a copy of the approved lighting plans (PS&E plans) with the local M&O District. Utility coordination for this type of project is handled per guidance in DGM 1-27.

Project Types B / C

The project documents shall be kept on file by the DelDOT Traffic Section. The local M&O District will receive copies of the final lighting deliverables during the handoff process. Utility coordination for this type of project is handled by the Traffic Design Group.

For Type B/C Projects, once the handoff form is provided and funding is verified, the Signal Construction Group will issue a Notice to Proceed to the selected Contractor to begin work on the project. The Contractor is responsible for coordinating all assigned construction activities with any other administered projects.

Project Type D

For lighting designs developed outside of the Department, all coordination regarding construction or implementation shall be handled by the designing entity.

If a design includes luminaires on utility poles, the Traffic Design Group shall provide a copy of the signed plans to the local utility company along with a Notice to Proceed. DelDOT's Contractor is responsible for notifying MISS UTILITY prior to beginning any construction. The Signal Construction Group will notify the Power Company at least 30 days in advance of a "turn-on" date.

The contractor should share shop drawings for any lighting equipment with the designer and maintenance districts for review and approval prior to purchasing anything. Once the designer and the local maintenance district have reviewed the shop drawings and deemed them acceptable, approval shall be granted to the contractor to purchase the lighting equipment.

All lighting designs that will eventually be owned and maintained by DelDOT must be inspected and approved by the maintenance district and a certified electrician prior to construction completion.

As completion of the project approaches, the construction manager should notify DelDOT Public Relations that new equipment will be activated, and to provide a "turn-on" date. The master electrician, or representative, of the local M&O District should attend the field activation. Representatives from the Traffic Design Group and the Signal Construction Group should also attend. Following activation, the project documents and the 'as-built' plans are handed off to the local M&O District and the project is accepted.

2.G As-Built Plans

If any design changes are necessary during construction, the contractor will work with the lighting designer and/or inspector to find an acceptable solution. It is expected that any significant changes during construction of the project will be handled via formal revisions, in coordination with the designer. At the end of construction, the contractor and inspector are responsible to document any additional changes to the project as part of an 'as-built' plan. The 'as-built' plan should be a record of the final location and operations of the lighting equipment, including any changes to the circuit diagram. The inspector is responsible to share this 'as-built' plan with the designer. The designer shall submit a copy

of the 'as-built' plans to the Traffic Design Group representative, the Archive Specialist in DelDOT's Quality Section for archiving, DelDOT's North District Maintenance for inclusion into the DelDOT Road Lights Database, and to the local M&O district that will be responsible for the maintenance of the lighting equipment. M&O shall keep these final 'as-built' plans for maintenance purposes and should also store a copy in the lighting control cabinet.

3. LIGHTING WARRANTS

Chapter 3 LIGHTING WARRANTS

Roadway lighting warrants are established to provide a standard methodology for approving and installing lighting for state-owned roadways throughout Delaware.

Roadway lighting should be considered for new construction, reconstruction, or other projects that include any one of the following characteristics:

- Proposed roadway or alignment
- Proposed widening
- Modified intersection configuration
- Modified lane configuration or extended lane length
- Traffic study concludes that lighting is warranted

It should be noted that DelDOT will not install or maintain lighting systems for any application other than roadway lighting on state-maintained roadways, or entrances to subdivisions unless justified.

3.A Lighting Warrant Guidelines

This section describes the roadway lighting warrant evaluation process. Evaluating the need for lighting is a multi-step process. The warrants do not automatically represent a requirement to provide lighting. In all cases, the installation of lighting or the continuation of existing lighting depends upon certain constraints, including the availability of authorized funds for this purpose, project scheduling and priorities, environmental factors, Right of Way limits, and others. These limitations shall prevail. For CTP projects, if conceptual design layouts are available, they should be provided as part of the warrant evaluation to ensure a mixture of dark and light conditions are not implemented. If a mixture of dark and light conditions are unavoidable, alternatives roadway improvements may be required instead of lighting.

In addition to the constraints above, Delaware State Code requires a stepwise process be followed before roadway lighting is installed. Title 7, Chapter 71A of the Delaware Code states "An outdoor lighting fixture may be designed, installed, or replaced only if…the purpose of the outdoor lighting fixture cannot be achieved by the installation of reflective road markers, lines, warning or information signs, or other effective passive methods." As such, even if lighting is found to be warranted based on guidance presented in subsequent Sections of this policy, lighting shall not be provided if alternative roadway and safety improvements are identified that can satisfy the purpose for lighting. Instead, these alternative improvements should be implemented and their effectiveness to satisfy the need for roadway lighting should be evaluated before roadway lighting is installed.

For example, if roadway lighting is found to be warranted at a horizontal curve, alternative improvements which can satisfy the purpose for lighting must be investigated. Implementing curve warning signage, chevrons, lane markings, or raised pavement markings (RPMs) could satisfy the purpose for lighting at this location. Therefore, lighting would not be installed. Once these devices have been installed, their effectiveness for satisfying the purpose for lighting can be reevaluated to determine if additional alternative improvements to lighting should be installed. If no alternative improvements exist, then lighting can be installed.

The warrant evaluation process for roadway lighting is illustrated in the flow chart in **Appendix U**.

3.A.1 Completing Form A

From the flow chart in **Appendix U,** select facilities require the completion of 'Form A'. A copy of 'Form A' can be found in **Appendix V.** 'Form A' evaluations can be completed at standalone intersection locations or along roadway segments in between intersections. CTP projects should utilize 'Form A' to evaluate both conditions whenever applicable. The form evaluates the need for lighting based on multiple parameters.

The data required to complete 'Form A' includes:

- Functional Classification of Roadway(s) based on DelDOT Functional Classification Maps (available on DelDOT's website)
- Most Recent Year AADT of Roadway(s)
- Speed Limit of Roadway(s)
- Stopping Sight Distance (SSD) on all approaches to the intersection or uncontrolled crossing and along the roadway segment
- Presence of a marked pedestrian crossing on the major roadway
- Presence of existing overhead roadway lighting on any Delaware-maintained roadway approach
- For intersections only, presence of any of the following:
  - Signalization
  - Mini-roundabout (see Section 3.A.2.a.iii for definition)
  - Left turn bays, bypass lanes, and/or right turn lanes
  - Lane drop [i.e. reduction/merge]
  - Medians 6 feet or greater in width

Based on the available data, 'Form A' will assign a value for each evaluated facility.

The warranting conditions are as follows based on the assigned score:

- A score of 19 or higher should warrant lighting.
- A score of less than 10, lighting shouldn't be considered. However, on special situations DelDOT Traffic may request additional studies.
- A score of 10-18 should result in further studies being performed. Steps to be taken for further studies are detailed in Section 3.A.1.a.

Meeting the warranting condition with a score of 19 or higher does not represent an automatic requirement by the Department to provide lighting, but indicates that lighting may be considered. Additionally, as mentioned in Section 3.A and Title 7, Chapter 71A of the Delaware Code, a stepwise process should be followed which investigates alternative roadway improvements which can satisfy the purpose of lighting.

3.A.1.a Performing Further Studies as part of Form A (Score of 10-18)

If a facility is assigned a score between 10-18 by 'Form A', further studies should be performed in coordination with DelDOT Traffic sections. Further studies should include, but are not limited to:

- Crash evaluations at the study location using at least 3 years of historical crash data.
- Comparison of nighttime crashes to overall crashes within the study area.
- Evaluating existing field devices and determining if additional devices could be implemented to improve operations and safety prior to the pursuit of roadway lighting.
- Consideration of additional roadway features not captured by "Form A".
- If available, review of historical studies at the facility as well as current or future improvement projects.
- Collecting detailed vehicular, bicycle, and pedestrian data.

Once further studies have been reviewed by DelDOT Traffic sections, DelDOT Traffic can determine if lighting is warranted at the facility. Documentation of the lighting study or determination, as well as a description/sketch of the area that will require lighting should be submitted to DelDOT's Traffic section for review/consideration. If any alternative improvements to roadway lighting are found, they should be implemented, and lighting should not be installed.

3.A.2 Facilities Evaluation

The following section discusses the lighting warrant process for different roadway facilities as illustrated by the flowchart in **Appendix U**.

3.A.2.a Non-Access Controlled Facilities

3.A.2.a.i Intersections, Uncontrolled Pedestrian Crossings, and Roadway Segments

The warrant evaluation process for intersections (including signalized, unsignalized, high-intensity activated crosswalk beacons [HAWKs]), and uncontrolled crossings (including rectangular rapid flashing beacons [RRFBs]) on non-access-controlled roadways as well as roadway segments requires the completion of 'Form A'. A copy of 'Form A' can be found in **Appendix V**. See Section 3.A.1 for information regarding the application of 'Form A'. Any corridor based CTP projects should evaluate lighting warrants for standalone intersections as well as roadway segments in between intersections.

3.A.2.a.ii Facilities with Existing Overhead Roadway Lighting

Locations that have existing lighting require the completion of a warranting evaluation form, referred to as 'Form A'. A copy of the 'Form A' can be found in **Appendix V**. See Section 3.A.1 for information regarding the application of 'Form A'. Existing private and sub-division entrances are not part of this requirement.

3.A.2.a.iii Roundabouts

All standard sized roundabouts with an inscribed diameter of 90 feet or greater, except those located wholly within commercial/residential developments or subdivisions, shall be illuminated. This includes roundabouts on external roadways that serve as development entrances. See **Chapter 4** for additional information on roundabout lighting design criteria. In addition, see DelDOT's DGM on roundabouts for additional information regarding design guidance for roundabouts.

All mini-roundabouts with an inscribed diameter of less than 90 feet, except those located wholly within commercial/residential developments or subdivisions, require the completion of the 'Form A'. A copy of 'Form A' can be found in **Appendix V**. See Section 3.A.1 for information regarding the application of 'Form A'.

3.A.2.a.iv Other Areas

There could be other locations on non-access controlled roadways that have not been captured by the Lighting Warrants Flow Chart (in **Appendix U**) or Form A (in **Appendix V**), but where a combination of favorable factors exist and Engineering Judgement indicates that lighting would be useful. For these locations, an engineering study should be completed justifying the need for lighting. The engineering study should be performed/overseen by a registered professional engineer, and at a minimum include a justification of why lighting would be beneficial, a site visit assessment, and an evaluation of the site's crash history. The engineer should prepare a memo detailing the site conditions and supporting information for the recommendation to light the location. The memo should be submitted to DelDOT Traffic for review and potential approval.

3.A.2.b Controlled-Access Facilities

Roadway lighting is warranted on controlled-access roadways at the following locations:

- Junctions of Mainline Routes
- Ramp Terminals on the mainline and crossroads

3.A.2.c Other Special Areas

Lighting is warranted at the state-maintained access points to Toll Plazas, Service Plazas, Rest Areas and Weigh Stations.

3.A.2.d Maintenance Projects

Typically, roadway lighting is not required to be considered for maintenance projects. If existing lighting is impacted during construction, it must be replaced in kind.

4. LIGHTING REQUIREMENTS AND ANALYSIS

Chapter 4 LIGHTING REQUIREMENTS AND ANALYSIS

This chapter provides information on performing lighting photometric calculations. These calculations are necessary to determine if a lighting design meets set requirements.

4.A Area to be Illuminated

Once lighting is warranted, it is necessary to define the area of roadway that should be illuminated. The area of illumination will be different for every project, and will depend on multiple factors, including the nature of the roadway, intersection, or surrounding area. General guidance on common roadway conditions are provided to help the designer more clearly define the area of illuminance for their own project.

For typical example figures showing area of illumination requirements for different roadway conditions, see **Appendix W**.

4.A.1 Intersections

Lighting designs at intersections can generally be classified as simple intersection designs or complex intersection designs. Simple intersections are the default intersection lighting treatment classification.

Complex intersections typically have the following characteristics:

- Channelized turn lanes
- Separate turn lanes (right and/or left)
- Four or more total lanes in a single direction (including through and turn lanes)

An intersection may also be classified as complex by the Chief of Traffic Engineering or designee based on other considerations, which could include the following:

- Nighttime crash rates
- Skew and/or curve of the intersection
- Vehicle speeds
- Large pedestrian presence
- Lane drop or other atypical geometry

4.A.1.a Simple Intersections

The area within all stop bars shall be the area of illumination for a simple intersection. This area shall include all crosswalks at the intersection. If a stop bar is not present on an approach, the area of illumination should extend up to the end of the corner radius.

See **Figure 1** in **Appendix W** for a typical example of the area of illumination for a simple intersection.

4.A.1.b Complex Intersections

The illumination area previously described under simple intersections will also be required for complex intersections.

Illumination should also be provided for the following features at complex intersections:

- Full storage length of all turn lanes
- Full storage length and taper of all acceleration lanes
- Approach lanes, up to the end of the storage of the longest turn lane (turn lanes present)
- Approach lanes, up to the end of the corner radii (without turn lanes)
- Departure lanes, up to the end of the taper (acceleration lanes present)
- Departure lanes, up to the end of the corner radii (without acceleration lanes)
- All crosswalks at the intersection
- Other conflict points (vehicle or pedestrian), as determined by the intersection geometry.

See **Figure 2** in **Appendix W** for a typical example of the area of illumination for a complex intersection.

4.A.2 Roundabouts

The area of illumination at a roundabout should include the limits of the circular intersection area and the area of the roadway up to and including the crosswalks immediately adjacent to the roundabout and raised splitter islands. All conflict points should be illuminated.

The lighting should also be extended a minimum of 400 ft from the center of the roundabout along each road connecting to the roundabout. Light levels on these areas should meet the values shown in **Table 7** in Section 4.B.3 or otherwise required. Illumination is not required for the center island or the truck apron unless engineering judgement dictates otherwise. See **Figures 3A and 3B** in **Appendix W** for typical examples of the area of illumination for a roundabout.

4.A.3 Interchanges

The lighting designer may elect to have a pre-design meeting with the Traffic Design Group prior to performing a lighting design for an interchange.

Lighting designs at interchanges can generally be classified as partial interchange designs, or full interchange designs. Partial interchange designs are the preferred lighting treatment.

4.A.3.a Partial Interchange Lighting

Partial interchange lighting covers only the critical points of an interchange, which include areas where potential conflicts or hazards are present.

Partial interchange lighting designs typically include light for the following locations:

- Nose of gore
- Weaving areas
- Ramp terminals
- Full storage length of all deceleration lanes, and adjacent mainline lanes
- Full storage length and taper of all acceleration lanes, and adjacent mainline lanes
- Conflict and/or decision points

At off-ramp terminal locations, the illumination area for both the deceleration lane and the adjacent mainline lane should begin where the deceleration lane reaches its full width. This illuminance area will

continue up to the physical gore. The illuminance area will extend an additional 200' past the physical gore point for both the mainline lane and the ramp. Off-ramps on curved roadways should have extended lighting along the mainline, in accordance with engineering judgment.
At on-ramp terminal locations, the illumination area for both the acceleration lane and the adjacent mainline lane should begin 200' prior to the physical gore point. The illuminance area will continue up to the physical gore and will then include the full length of both the acceleration lane and the taper.

All crossroad ramp terminals should have intersection lighting. Lighting levels on the crossroad approaches should not be reduced through the interchange.

When ramps share common weaving areas, such as cloverleaf interchanges, the weaving area will be lit.

If illuminance areas are present at the terminals of the same ramp and they are 500' apart or less, then continuous lighting will also be provided along the ramp.

4.A.3.b Full Interchange Lighting

Full interchange lighting is the lighting of the entire interchange, including all areas previously listed in partial interchange lighting, as well as the lengths of all ramps.

See **Figures 4 and 5** in **Appendix W** for typical examples of the area of illumination for interchange lighting.

4.A.4 Roadway Segments

The areas of illumination previously described were for specific geometric roadway conditions (i.e. intersections, interchange features, etc.). When two separate lighting areas are located close to each other, it can be beneficial to also light the area between them. For the purposes of this Policy, the area between two established areas of illumination will be referred to as a 'segment'. Lighting this 'segment' would provide continuous roadway lighting for the original areas of illumination and the 'segment'. Providing continuous lighting results in less strain on the driver's eyes, as they will not need to adjust from a lit roadway, to a dark roadway, and back to a lit roadway within a short distance. The designer should use the knowledge of their project to determine when segment lighting could be beneficial. A summary of the suggested segment distances between two areas of lighting are provided in **Table 5** below:

Table 5 - Illumination of Roadway Segments

	Distance Between Area Limits (Combine into Continuous Lighting Section)	Distance Between Multiple Systems (Combine into Continuous Lighting Section)
Simple Intersections	300'	1,000'
Complex Intersections	400'	1,000'
Non-Access Controlled Highway (at Interchange)	400'	1,500'
Interstate / Controlled Access Highway (at Interchange)	500'	2,500'
Roundabouts	500'	1,000'

See **Figures 6, 7 and 9** in **Appendix W** for typical examples of area of illumination for roadway segments.

Once the designer determines the area of illumination for their project and the required light levels, they will then proceed with the lighting analysis. A lighting analysis is necessary for all new roadway lighting designs, as well as any designs that include significant reconstruction. If existing lighting fixtures on existing poles will be replaced, then these fixtures should be included as part of the lighting analysis. For projects where existing lighting poles will not be relocated and existing fixtures will not be replaced, a lighting analysis is not required.

Performing a lighting analysis consists of determining the optimum layout of lighting fixtures by running photometric calculations. These calculations are necessary to determine if a proposed lighting design meets DelDOT's requirements. Photometric calculations can be performed by using commercially-available computer software programs. DelDOT recognizes that the designer has options on which software they can use when performing their designs, but the most common lighting design software used by the Department is Visual.

The information below provides a detailed explanation of the steps involved in performing a lighting analysis.

4.B Level of Illuminance

The illuminance method will be the recognized method of analysis for typical DelDOT lighting designs. This method considers the amount of light produced from luminaires that strikes a surface. A lighting designer is able to program the lighting design software to consider the light produced by the inputted luminaires at the same time. The software can then calculate the amount of light that falls at any point specified by the designer. The individual calculated point values can then be grouped to produce summarized calculated values for general statistical areas.

DelDOT has developed pre-determined illuminance values that lighting designs must reach to meet state standards. These illuminance levels are categorized first by classification of the roadway (or pedestrian facility, as applicable) and are then further categorized by the classification of the general land use surrounding the project. To determine the recommended lighting levels for their project, the designer will need to first identify the classification of each roadway (or pedestrian facility) that requires lighting within the project limits, as well as general land use classifications for the properties that surround any areas to be lit. Additional information on how to properly determine the target illuminance values for a project are described in the sections below.

4.B.1 Roadway Classification

Once the lighting designer determines that lighting is warranted on a roadway, they then need to first determine the Functional Classification of the roadway to establish the illuminance values for their project.

All roads in Delaware are assigned a Functional Classification. These classifications are as follows:

- Principal Arterials:
  - Interstate
  - Other Expressway & Freeway
- Other Principal Arterial
- Minor Arterial
- Collectors:
  - Major Collector
  - Minor Collector
- Local

Roadway classifications used in **Table 7** in Section 4.B.3 shall be based on the DelDOT Functional Classification Map, which is available on the DelDOT website.

Additional facilities are listed in the table that would not require the use of the Functional Classification Map. These facilities include Alleys, Sidewalks, and Pedestrian/Bicycle Ways. These facilities can be identified without the use of a Map.

4.B.2 Area Classification

Another important factor that helps a designer establish target illuminance values for their design is the classification of the properties surrounding their project. For the purposes of roadway lighting, there are three options for classifying the general land use adjacent to a project – Commercial, Intermediate, or Residential. General definitions of these land uses can be found below, and are based on information in the AASHTO *Roadway Lighting Design Guide*. **Table 6** can be used as general guidance when determining the land use classification at an intersection. Once the land use for the lighting project has been determined, it shall be applied to **Table 7** in Section 4.B.3.

Table 6 – Area Classification Support at Intersections

Intersection Information	Overall Land Use Classification for Intersection
• All corners/legs of intersection: businesses	Commercial
• 3 corners/legs of intersection: business • 1 corner/leg: residential	Commercial or Intermediate
• 2 corners/legs of intersection: businesses • 2 corners/legs: residential	Intermediate
• 3 corners/legs of intersection: residential • 1 corner/leg: business	Intermediate or Residential
• All corners/legs of intersection: residential	Residential

4.B.2.a Commercial

That portion of a municipality in a business development where ordinarily there are large numbers of pedestrians and a heavy demand for parking space during periods of peak traffic or a sustained high pedestrian volume and a continuously heavy demand for off-street parking space during business hours. This definition applies to densely developed business areas outside of, as well as those that are within, the central part of a municipality. Projects located in Urban areas should also utilize commercial target values, unless engineering judgement dictates otherwise.

4.B.2.b Intermediate

That portion of a municipality which is outside of a downtown area but generally within the zone of influence of a business or industrial development, often characterized by moderately heavy nighttime pedestrian traffic and a somewhat lower parking turnover than is found in a commercial area. This definition includes densely developed apartment areas, hospitals, public libraries, and neighborhood recreational centers.

Projects located in Sub-Urban areas should also utilize intermediate target values, unless engineering judgement dictates otherwise.

4.B.2.c Residential

A residential development, or a mixture of residential and commercial establishments, characterized by a few pedestrians and a low parking demand or turnover at night. This definition includes areas with single family homes, townhouses, and/or small apartments. Regional parks, cemeteries, and vacant lands are also included.

Projects located in Rural areas should also utilize residential target values, unless engineering judgement dictates otherwise.

4.B.3 Recommended Lighting Levels

A summary of the recommended light levels is shown in **Table 7**, which has been adapted from the AASHTO *Roadway Lighting Design Guide,* Seventh Edition.

Table 7: Illuminance Design Values

Roadway and Walkway Classification	Off-Roadway Light Sources	Illuminance Method		
		Average Maintained Illuminance	Minimum Illuminance	Illuminance Uniformity Ratio
	General Land Use	foot-candles (min)	(foot-candles)	avg/min (max)
Principal Arterials – Interstates, Other Expressways/Freeways	Commercial	0.6	0.2	4:1
	Intermediate	0.6	0.2	4:1
	Residential	0.6	0.2	4:1
Other Principal Arterials (Partial, or no control of access)	Commercial	1.6	As uniformity ratio allows	4:1
	Intermediate	1.2		4:1
	Residential	0.8		4:1
Minor Arterials	Commercial	1.4		4:1
	Intermediate	1.0		4:1
	Residential	0.7		4:1
Collectors (Both Major and Minor)	Commercial	1.1		4:1
	Intermediate	0.8		4:1
	Residential	0.6		4:1
Local	Commercial	0.8		6:1
	Intermediate	0.7		6:1
	Residential	0.4		6:1
Alleys	Commercial	0.6		6:1
	Intermediate	0.4		6:1
	Residential	0.3		6:1
Sidewalks	Commercial	1.3		3:1
	Intermediate	0.8		4:1
	Residential	0.4		6:1
Pedestrian Ways and Bicycle Ways[1]	All	2		3:1
Intersections/Roundabouts	Lit to the strictest lighting requirements of the individual roadways.			

Notes:

1. Pedestrian Way and Bicycle Ways facilities are assumed to be separated from the roadway. For situations where Pedestrian Ways and Bicycle Ways are adjacent to roadway, use roadway design values.
2. Higher levels of Illuminance may be justified depending on the project requirements.
3. Table adapted from AASHTO *Roadway Lighting Design Guide*, Seventh Edition.
4. Illuminance values shown are equal to values for R2-R3 surface materials requirements as defined by AASHTO.
5. The values shown in **Table 7** shall be used for all lighting designs unless otherwise directed by DelDOT Traffic.

It should be noted that for lighting at intersections of roadways, additional considerations will be necessary to determine the required lighting levels. Additional information on lighting at intersections has been provided in the following section.

4.B.3.a Intersections

When lighting is warranted at an intersection, the limits of the intersection should be lit to the highest recommended lighting level of the individual roadways.

4.B.3.b Roundabouts

Roundabouts should be treated as a typical intersection and should be lit to the highest recommended lighting level of the individual roadways that converge at the roundabout.

4.C Photometric File Preparation

Once the designer has determined the target illuminance values for their project, they can begin to set up the photometric calculation file. The information that follows will assist the lighting designer with setting up a proper photometric file, regardless of which software the designer chooses to utilize.

Additional information on photometric file set ups for two of the common lighting calculation software can be found in **Appendix X**.

4.C.1 Base Plan

Before a photometric calculation file can be set up, the lighting designer first has to create a CADD version of the base file. This base file is used by the designer to identify the ultimate physical conditions of the project that could have an impact on the final location of the lights. The information necessary to start a base file would include both surveyed information of the existing conditions as well as proposed design conditions. A list of typical features that would be shown on a lighting base plan can be found in **Table 8**.

Table 8 – Typical Lighting Base Plan Features

- Surveyed topography
- Ultimate locations of building lines, fences, trees, shrubs, etc.
- Right-of-way (existing and proposed)
- Limit of construction
- Clear zone
- Proposed baseline
- Road name labels
- Ultimate physical features (curb and gutter, islands, sidewalks, medians, shoulders, drainage structures, guardrail)
- Final locations of utilities (poles, manholes, underground conduits/pipes, overhead aerial lines, etc.)
- Location of existing lighting equipment (poles, controller cabinet, junction wells, etc.)
- Ultimate locations of all traffic equipment
- Ultimate striping condition
- Ultimate structure locations
- Bus stops and loading zones

The designer is responsible to set up this base file, which can then be imported into the lighting design software and used to complete the lighting photometric calculations.

4.C.2 Point Calculations

Once the designer has brought the base file into the lighting design software, they can begin setting up the photometric calculations. These calculations are performed by utilizing a point-by-point method. A grid of calculation points should be added to any area where lighting is warranted. The spacing of points shall be 5' x 5' for areas of roadway with no pedestrians. A grid spacing of 2' x 2' shall be used for locations with a pedestrian presence, whether on the roadway or on an off-roadway location. Engineering judgement should be used for point spacing in locations that the designer might feel are of a higher concern, such as high crash locations, areas with sight distance issues, etc.

4.C.3 Statistical Areas

Once photometric calculation points are added to the file, they will need to be grouped into separate statistical areas. These statistical areas are created in order to group together points that will be targeting the same recommended levels of illuminance. When the photometric calculations are performed, each statistical area will summarize the results of all the calculation points within its boundaries. The designer will use these statistical area results to verify that their lighting designs are meeting the required target values.

4.D Fixture Criteria

Once the background and calculation points are added to the photometric file, the designer must then select a luminaire to assess. When completing a design where the addition of new lighting is necessary, the designer should first consider the option of adding fixtures to existing (or proposed) utility poles. This is DelDOT's preferred method for roadway lighting. At locations where utility poles are not present, the lighting designer should then investigate the option of adding new utility poles specifically to support proposed luminaires. Any lighting equipment proposed to be installed on a utility pole shall be in accordance with the local utility company's standards and need to be approved by the utility company. The designer should ensure that any proposed utility poles are outside of the clear zone and within the Right of Way. See **Chapter 6** for additional information on the installation of light fixtures on utility poles.

For projects where it is not possible to mount fixtures to a utility pole, or it is not in the best interest of the Department, the designer will need to complete a lighting design where fixtures will be mounted on DelDOT owned metal lighting poles. The criteria that the designer needs to consider when selecting a luminaire to be installed on a DelDOT owned light pole can be found in the following sections.

4.D.1 Luminaires

It is a lighting designer's responsibility to have a working knowledge of the various factors that make a luminaire distinctive, and to determine the lighting fixture preferences of the local M&O districts. It is not the Traffic Design Group's responsibility to direct which fixtures the designer needs to use for a lighting design.

Light-Emitting Diode (LED) lamps shall be considered standard for all DelDOT lighting applications. If lighting exists within a project's limits, and it is a fixture other than LED, then the designer is required to upgrade the existing fixture with an LED fixture as part of the project. Other types of lamps shall not be used for roadway lighting unless approved by the Chief of Traffic Engineering or designee.

Identification decals shall be placed on the outside of the driver housing on all roadway luminaires used in DelDOT roadway lighting projects. The decal should be white to identify that the type of light source is LED and should indicate the specific wattage of the fixture.

Cobrahead luminaires with cutoff optics should be considered standard for use in conventional roadway lighting installations. Other types of luminaires, including any tilt angle fixtures, shall not be used unless approved by the Chief of Traffic Engineering or designee. See **Appendix P** for a sample technical memorandum of non-standard lighting fixture approval process.

4.D.1.a Wattage and Lumens

It is recognized that LED lighting fixtures produced by different manufacturers will never be the same. Due to this concern, the Department has instead specified certain parameters that must be satisfied when the designer is selecting what fixture to utilize for their design. Fixtures that meet the parameters in **Table 9** shall be considered acceptable for use in conventional DelDOT roadway lighting facilities.

Table 9 - LED Lighting Fixture Parameters

LED Luminaire: 400 Watt HPS Equivalent		LED Luminaire: 250 Watt HPS Equivalent		LED Luminaire: 150 Watt HPS Equivalent	
Wattage	Lumens	Wattage	Lumens	Wattage	Lumens
250 (Maximum)	27,000-31,000	175 (Maximum)	16,000-20,000	90 (Maximum)	8,000-12,000

Roadway luminaires not meeting the above criteria shall not be used in DelDOT roadway lighting facilities unless otherwise directed by the Chief of Traffic Engineering or designee. Additional information regarding LED fixture requirements are provided in DelDOT's standard specification for LED luminaires.

4.D.1.b Vertical Light Distribution

Luminaires with a medium vertical light distribution shall be considered standard for use in roadway lighting installations. Luminaires with other types of vertical light distribution shall not be used unless otherwise directed by the Chief of Traffic Engineering or designee.

4.D.1.c Lateral Light Distribution

Manufacturers develop luminaires to produce beams of light in a specific pattern, which are referred to as lateral light distribution patterns. Luminaires with Type II, Type III and Type IV lateral light distributions shall be considered standard for use in DelDOT roadway lighting installations. Fixtures with a Type II or Type III distribution are more commonly used along stretches of roadway that are up to four lanes wide. For wider roadways, and at intersections, fixtures with a Type IV distribution are typically used. Luminaires with other types of lateral light distribution should not be used unless otherwise approved by the Chief of Traffic Engineering or designee.

4.D.1.d Color Temperature

An important criteria to consider when selecting an LED fixture is the color temperature (measured in Kelvin) which measures the 'warmness' or 'coolness' of the light. Higher color temperatures are associated with 'cooler' light sources, which are more blue in hue, and gives the driver a feeling of

daytime conditions. Lower color temperatures measure 'warmer' light, which appears more yellow. LED fixtures installed on DelDOT projects must have a color temperature in the range of 3,000K to 4,000K. High mast luminaires may have a color temperature up to 5,000K. All luminaires installed as part of the same project should utilize the same color temperature. High mast luminaires may be designed with a different color temperature than roadway luminaires, as necessary.

4.D.1.e Light Control

The 'BUG' classification system is the way to evaluate the light that is emitted by LED fixtures. This system categorizes the overall optical performance of an LED fixture by considering three different factors – B: the 'Backlight', U: the 'Uplight' and G: the 'Glare'. The value for each of these factors ranges from '0' to '5'. Each LED luminaire is assigned a value for each of these factors. These factors are especially important to consider in order to find a fixture that meets the criteria of Delaware's State Code, Title 7 – Section 71A, which only allows state funds to be used for lighting fixtures that were selected with consideration given to conserve energy, reduce glare, minimize light pollution, and preserve the natural night environment.

Backlight refers to the amount of light that spills back towards the light pole, away from the roadway. A fixture with a 'B' value of '0' would have very little light directed away from the roadway, while a fixture with a 'B' value of '5' would have the most possible light directed away from the roadway. The designer should consider the surrounding environment of the project and the backlight value that would be appropriate when selecting a fixture for their project. For projects located in residential areas, fixtures with lower backlight ratings should be considered to direct the light towards the roadway and reduce lighting trespass on private property. For locations where lighting trespass is a big concern, the designer has the option of proposing that a shield be added to the light fixture. Shields help to redirect the light emitted by a fixture so that it only shines on the intended surface where it is useful.

Uplight refers to the amount of light that a fixture directs upwards towards the sky. A fixture with a 'U' value of '0' would not be allowing any light to be directed skywards, while a fixture with a 'U' value of '5' would have no limitations on the amount of light that is being emitted upwards. All LED light fixtures used for roadway lighting designs shall have a 'U' value of '0'. This value meets the criteria of Title 7 – Section 71A, which only allows state funds to be used for lighting fixtures that are classified as 'cutoff'. Although the term 'cutoff' is no longer utilized with LED fixtures, a 'U' value of '0' would meet the same criteria.

Glare is a measurement of how much light leaves a light fixture at an angle that may be detrimental to motorists. Glare 'G' is given a value between 0 and 5 based on the number of lumens that leave the fixture which is defined by IES as "Forward Light High" and "Forward Light Very High" angles. These angles are from 60 degrees to 90 degrees. Fixtures with lower Glare values have less lumens leaving a fixture at these angles than fixtures with high Glare values. Therefore, fixtures with lower Glare values typically cause less glare issues than fixtures with higher Glare values. The designer is responsible for taking Glare into account when determining fixture locations as well as mounting heights.

4.D.1.f Drive Current

LED drivers regulate the electricity necessary for an LED fixture to perform to its ultimate capabilities. LED fixtures produced by different manufacturers will be designed to utilize specific drive currents. Higher drive currents tend to result in higher amounts of energy that is needed to power a fixture. In

order to limit the energy consumption of lighting fixtures, and encourage a more efficient design, LED roadway lighting fixtures shall have a maximum drive current of 1050mA.

4.D.1.g Special Fixtures

The information in the previous sections was applicable for standard roadway luminaires. Designs may arise where the use of less common fixtures may be necessary for roadway lighting purposes. These special fixtures have been further detailed in the sections below.

4.D.1.g.i High Mast Luminaires

Lighting designs for interchanges, ramps, tolls, large highway areas, rest areas, or other similar applications may be best suited for the use of high mast luminaires. For high mast luminaires, higher wattages and lumen values than typical roadway luminaires may be necessary. Fixtures with different distribution types may also produce more efficient lighting designs. High mast lighting designs are typically calculated using fixture arrays, which assumes multiple fixtures will be mounted to a high mast pole in an array. Most high mast designs with arrayed fixtures can have anywhere from three to eight fixtures, depending on the photometric requirements. The lighting designer shall coordinate with the local Maintenance District regarding their preference on high mast lighting installations prior to performing any high mast lighting design.

For additional information on high mast lighting, see the AASHTO Roadway Lighting Design Guide.

4.D.1.g.ii Underpass and Tunnel Luminaires

Lighting designs for bridge underpasses, tunnels, or other similar applications may be best suited for the use of underpass luminaires. For underpass luminaires, lower wattages and lumen values than typical roadway luminaires may be necessary. Fixtures with different distribution types may also produce more efficient lighting designs. The lighting designer should have a pre-design meeting with the Traffic Design Group if they are considering the use of underpass lighting.

Underpass lighting can be designed using the same method of lighting calculations used for roadway lighting design. Tunnel lighting calculations should use the luminance method of lighting calculations. This method considers the amount of light reflected off a surface in a certain direction. For additional information on tunnel lighting, please refer to RP-22-11, 'Tunnel Lighting'.

4.D.2 Light Loss Factor

Typically, the photometric .ies file of a specific fixture, which is provided by the manufacturer, uses the initial lumen output value. All lighting fixtures suffer reductions in performance over time, slowly reducing their lumen output due to various factors, including dirt on the fixture and depreciation of the lamp itself. This loss of performance is typically accounted for during the photometric calculation process by incorporating a Light Loss Factor (LLF) during the lighting analysis. By utilizing an LLF during the calculation phase, it produces lighting results that consider the design criteria for the lifespan of the fixture. Using a Light Loss Factor ensures that the project is designed using pole spacings and arrangements that will provide effective illumination well past the initial lighting system installation.

The basic LLF calculation for LED luminaires for DelDOT consists of two different metrics which are then multiplied together to form a single factor. These two metrics are: Luminaire Dirt Depreciation (LDD) and the Lumen Maintenance Factor (LMF). These two values are explained in detail below.

Luminaire Dirt Depreciation (LDD):

Lamp Dirt Depreciation is a factor that accounts for dirt accumulation that is responsible for a reduction in luminaire light output over time. The LDD for LED fixtures is dependent on the material and size of the outer optics. The fixtures typically used by DelDOT have Linear Molded Acrylic outer optics. For these fixtures, a Luminaire Dirt Depreciation factor of 0.9 can be used. For fixtures that have a different outer optic (i.e. individually molded acrylic or glass optics), a lower LDD value must be used. Refer to IES RP-8 for the appropriate Luminaire Dirt Depreciation factors. A technical memorandum related to the development of the LDD value is provided in **Appendix P**.

Lumen Maintenance Factor (LMF):

The Lumen Maintenance Factor is a factor provided by the luminaire manufacturer for a given fixture. This factor is typically based on extrapolated data which is collected by the manufacturer during luminaire testing. This factor expresses the reduction in lumen output of a given fixture over a specific time period. The Lumen Maintenance Factor is typically presented as a percentage of the initial lumen output at 60,000 hours. Some manufacturers use alternate durations of time to calculate their Lumen Maintenance Factor. In these cases, only Lumen Maintenance Factors for longer time periods can be used.

$$LDD * LMF = LLF$$
$$0.9 * 0.XX = 0.XX$$

If the vendor does not report the LMF factor in the fixture documentation, the designer should contact the vendor directly to obtain this information. In the rare occasion when the designer is not able to determine the LMF factor for a typical DelDOT fixtures with Linear Molded Acrylic optics, an overall value of 0.83 can be used for the LLF.

4.D.3 Light Fixture Locations

Once the lighting designer has selected a luminaire for their design, they will then need to enter their chosen fixture, and the relevant criteria previously mentioned, into the lighting design software. Photometric calculations will need to be performed utilizing the chosen fixture to determine the optimal lighting layout for each project's conditions. Additional information that the designer will need to consider when determining the locations of the proposed luminaires can be found in the following sections. For additional information on design criteria for luminaire installations on utility poles, see **Chapter 6**.

4.D.3.a Mounting Height

For luminaires installed on utility poles, the typical mounting height is approximately 25 to 30 feet, but the actual height that the fixture is installed on a utility pole is subject to the height of the overhead utility lines on the same pole. The designer should coordinate directly with the utility company to determine the preferred mounting height of any proposed utility pole fixtures.

All luminaires not mounted on utility poles shall be mounted on DelDOT owned aluminum lighting poles. The height of the lighting pole will vary depending on the type of location it is being installed. For typical intersections, roundabouts and roadway segments, a mounting height of 30 feet should be used. For interchange and freeway designs, a mounting height of 40 feet is more common.

For luminaires installed on high mast poles, the mounting height of the fixture will be dependent on the height of the pole. Typical high mast pole heights range from 70 feet to 100 feet.

4.D.3.b Arm Length

For lighting being installed on utility poles, the designer should coordinate directly with the utility company to determine the arm lengths that are currently available.

All luminaires not mounted on utility poles shall be mounted on DelDOT owned aluminum lighting poles by using aluminum davit arms. The arm length will vary depending on the area of illumination for the design and the physical location of the pole, but typical arm lengths that should be used are as follows:

- 8'
- 12'
- 15'

If the designer proposes an arm length greater than 15', a special foundation design will be necessary to determine the appropriate pole base type. In these cases, the designer should refer to **Chapter 5** for additional information on requests.

It is preferred that lighting arms be installed perpendicular to the roadway. If the lighting design includes the installation of arms at an angle that is not perpendicular to the roadway, the lighting designer shall include a note with the angle between the lighting arm and roadway on the plan.

Lighting arms are prohibited from being installed on signal equipment unless otherwise directed by the Chief of Traffic Engineering or designee. If a lighting designer identifies existing luminaires that are mounted on existing signal equipment within their project limits, they should redesign to mount the luminaires on poles separate from the signal equipment.

4.D.3.c Pole Location

The last step before finalizing the photometric calculations is determining where the light poles should be located in order to meet the required illuminance values. Determining the optimal locations of lights that work with all other constraints of a project is typically an iterative process, as there are many design aspects that need to be considered. The following list provides some common design considerations that a lighting designer should take into account when determining the location of any proposed light poles. This list is not meant to be exhaustive, as every lighting design will have its own unique considerations.

- ADA standards (see DelDOT's *Pedestrian Accessibility Standards (PAS) for Facilities in the Public Right-of-Way*):
    - Must be maintained

    - Sidewalks/ramps cannot be blocked
- Drainage:
    - Location of pole cannot interfere with drainage flow
    - Low areas prone to wetness should be avoided
- Slope:
    - Steep slopes are not acceptable pole locations
    - Areas of level earth are encouraged
- Maintenance:
    - Lateral reach of maintenance vehicles is typically 20 feet
    - Accessibility of poles for maintenance personnel
- Structures:
    - Lighting poles should be placed to avoid sign structures
        - 30' Lighting Poles should be placed at least 50' from sign structures
        - 40' Lighting Poles should be placed at least 70' from sign structures
    - Bridge locations should be considered when light poles are placed nearby
    - Large vegetation should be avoided or considered for trimming removal
- Utilities:
    - Overhead
    - Underground

Smaller intersections can typically be satisfactorily lit by installing two luminaires on diametrically opposed corners of the intersection. Although this is generally true, photometric calculations must be completed for every lighting project to ensure that the lighting design meets the necessary criteria.

Lighting poles installed at roundabouts should be located on the outer edge of the roadway.

For lighting designs at a pedestrian crosswalk, luminaires should be placed so that the pedestrian crosswalk is illuminated by at least two lighting units to ensure lighting in the event of a failure of one of the units. Every effort should be made to light crosswalks so that pedestrians are in positive contrast, and more visible to approaching vehicles. This can typically be achieved by placing a lighting unit on either side of the roadway, located 10 to 30 feet prior to the crosswalk on the roadway approach.

Special consideration must be given to determine acceptable locations for lighting poles installed after the gore of an off-ramp or before the gore of an on-ramp. The designer should consider that vehicles at these locations could possibly be traveling at higher speeds, and when making directional changes could have a higher potential of leaving the roadway, resulting in more pole knock-downs. Lighting poles should typically be placed a minimum distance of 100 feet from the physical nose of the gore, but the designer should carefully consider lighting at any gore location.

For designs that involve installing lighting poles on bridges, poles should be located within the protection of the bridge railings or parapets. Approval from DelDOT's Bridge Section is also required for any lighting installed on bridges.

4.D.3.c.i Clear Zone

All proposed DelDOT owned standalone lighting poles shall be designed as breakaway poles and shall meet all breakaway requirements as established in the DelDOT Standard Specifications and Standard Construction Details. While breakaway devices offer a reasonable alternative to striking a "fixed" object, alternatives which reduce the potential of striking even these objects should be considered, since both shielding devices and breakaway devices can cause significant damage to vehicles when struck.

Therefore, every effort should be made to locate lighting poles outside of the clear zone. Situations may arise that could prohibit a pole from being located outside of the clear zone, such as geometric constraints. In these situations, the designer is encouraged to consider installing protection for the pole, either by using guardrail or other acceptable form of positive protection. When lighting poles are located behind guardrail, the necessary distance for rail deflection must be considered when determining the pole location. For 30' poles, the pole diameter near the base is approximately 10", while for 40' poles the pole diameter near the base is approximately 12". All guardrails shall be installed in accordance with DelDOT's *Road Design Manual* and DelDOT's *Standard Construction Details*. The installation of unshielded non-breakaway lighting poles within the clear zone for the sole purpose of supporting highway lighting is not acceptable.

The installation of breakaway lighting poles in islands and medians is allowable. However, it is preferable to keep them outside of the clear zone. Efforts should be made to place the breakaway lighting poles outside of the clear zone by considering alternative design approach as well as placing them outside the edge of the roadway. Normally, it will not be acceptable to install non-standard (non-breakaway) light poles in these locations, unless the islands or medians are larger than normal. However, on some rare occasions non-standard light poles can be installed in these locations with the approval of the Chief of Traffic Engineering or designee.

For additional information on the placement of poles and clear zone requirements, refer to AASHTO's *Roadside Design Guide* and the latest version of DelDOT's *Traffic Design Manual*.

4.D.3.c.ii Utility Clearance

Clearance distances between proposed lighting equipment and utilities must be considered when designing a lighting system. When determining where to place proposed equipment, the designer will need to verify that standard clearances are met by all local utility company standards, as well as IEEE's *National Electrical Safety Code (NESC)*.

Any above-ground equipment should be located a minimum of 10 feet from primary electrical lines, 3 feet from any secondary electrical lines, and 2 feet from communication lines.

Any below-ground equipment should be located at least 2 feet from any other utilities.

For additional information on utilities and lighting design, see **Chapter 6**.

4.E Special Lighting Cases

4.E.1 Nighttime High Crash Locations

Lighting installations that are warranted for high crash locations should include lighting of the actual area with the high crash rate concerns, as well as lighting in advance of the area so that drivers can detect the area prior to driving through it. Engineering judgement should be used to determine how far in advance lighting would be beneficial when approaching a high crash location. Multiple lighting units should be used at these locations to ensure lighting in the event of a unit failure.

4.E.2 Bridges and Overpasses

The roadway surface of bridges and overpasses located on state-maintained roadways that are continuously lit should be lit to the same level as the roadway on either side of the structure. If bridge lighting exists within a project, then the design shall maintain or replace the bridge lighting, as necessary.

Before the lighting designer considers the installation of lighting on a bridge or an overpass, they should coordinate with DelDOT's Bridge Section to verify that it is feasible to mount proposed lighting on the structure. Additional coordination will be needed during the project to ensure that the proposed lighting system is properly designed to be incorporated with the structure. If a bridge is not being replaced as part of the project, but lighting is warranted, the designer shall coordinate with DelDOT's Bridge Section to determine their design options.

When historical or decorative bridge lighting is proposed but does not meet warranting criteria, it will be designed according to engineering judgment and in accordance with the applicable sections of this Policy.

4.E.3 Underpasses and Tunnels

The lighting designer is required to have a pre-design meeting with the Traffic Design Group prior to performing a lighting design for a tunnel.

The roadway surface of an underpass located on state-maintained roadways that are continuously lit shall be lit to the same level as the roadway on either side of the structure. If underpass lighting exists within a project, then the design shall maintain or replace the underpass lighting, as necessary.

Before the lighting designer considers the installation of lighting for an underpass or a tunnel, they should coordinate with the DelDOT's Bridge Section to verify that it is feasible to mount proposed lighting on the structure. Additional coordination will be needed during design to ensure that the proposed lighting system is properly designed to be incorporated with the structure. If the structure is not being replaced as part of the project, but lighting is warranted, the designer shall coordinate with DelDOT's Bridge Section to determine their design options.

The design of tunnel lighting should follow IESNA's RP-22-11.

The design of underpass lighting should follow the AASHTO Roadway Lighting Design Guide.

4.E.4 Toll and Service Plazas

The lighting designer is required to have a pre-design meeting with the Traffic Design Group and Maintenance District prior to performing a toll plaza or service plaza lighting design.

4.E.5 Development Access Points

If lighting is desired at a development access point, it will be the responsibility of the Developer and/or the Development Corporation. If a lighting system exists prior to the development access point being added, the developer is required to update the lighting system to incorporate the new access point.

4.E.6 Decorative Roadway Lighting

Non-standard decorative roadway lighting poles or luminaires will not be used on DelDOT projects, unless approved by the Chief of Traffic Engineering or designee. If an outside Agency agrees to own and maintain the decorative lighting, then non-standard decorative poles or luminaires may be proposed.

Any decorative roadway lighting on state-maintained roads should be approved by the Chief of Traffic Engineering or designee.

4.E.7 Uncontrolled Crossings

When lighting is warranted at uncontrolled crossings, the following areas shall be lit: the area of the marked crosswalk, the landings, and a minimum of 100 feet of roadway approaching the crosswalk. The area to be lit approaching the crosswalk should be increased based on the speed limit of the roadway, project specific requirements, and engineering judgement.

See **Figure 8** in **Appendix W** for a typical example of area of illumination for crossings.

4.E.8 Off-Roadway Bicycle and Pedestrian Ways

Lighting for off-roadway bicycle and pedestrian ways may be considered when the path is expected to have night usage, and when an outside Agency agrees to own and maintain the lighting system and fund the continuing electric costs.

In the cases it is decided to light a pedestrian or bicycle way, then it shall be illuminated in accordance with DelDOT illuminance design values, which can be found in **Table 7** in Section 4.B.3.

When pedestrian lighting is located adjacent to a roadway, the lighting designer will consider the effect of the pedestrian lighting on vehicular traffic. When pedestrian lighting is proposed for pedestrian facilities located adjacent to a roadway, the roadway will also be illuminated.

4.E.9 Parking Lots

Parking lot lighting should be designed in accordance with IESNA's Lighting for Parking Facilities (RP-20-14). This includes lighting for Park & Ride lots, Park & Pool lots, and any other parking lot.

4.E.10 Overhead Sign Lighting

Overhead guide signs installed in Delaware are made from Type IX retroreflective sheeting or better. Therefore, overhead sign lighting is not currently required by DelDOT. For additional information on sign lighting, refer to the most recent edition of AASHTO's *Roadway Lighting Design Guide*.

5. LIGHTING DESIGN AND ELECTRICAL ELEMENTS

Chapter 5 LIGHTING DESIGN AND ELECTRICAL ELEMENTS

This chapter provides more detail on the information that should be shown on the plans and the design elements required for lighting projects.

Where possible, DelDOT prefers utility company owned and maintained (tariff) lighting over DelDOT owned lighting installations. All tariff lighting will need to be approved by the utility company. In areas where lighting is warranted, but tariff lighting is not feasible, then stand-alone DelDOT owned and maintained lighting equipment should be installed.

A tariff lighting design should provide information on the locations where fixtures will be mounted to utility poles, and the wattage of those fixtures. The designer is responsible to coordinate with the local utility company to verify which utility poles are able to support the proposed lighting fixtures, identify the lighting fixtures that utility company currently stocks, and to identify the preferred mounting heights for the fixtures.

DelDOT owned lighting designs require additional equipment and more information than tariff lighting designs. The designer is responsible to coordinate with the local utility company to verify location and level of power sources, but the design of the lighting equipment shall meet DelDOT's standards. For DelDOT owned lighting designs, the designer shall consider the following:

- Fixtures (type, location)
- Poles (type, location, size, foundations)
- Arms (length)
- Control cabinet (type, location, size, foundation)
- Wiring (size)
- Conduit (type, size, location)
- Junction wells (type, size, location)

This section describes the specific elements and equipment found in most DelDOT roadway lighting design projects. All items below should be considered as standard for DelDOT lighting. The designer should coordinate with the local district M&O office to ensure that acceptable equipment is being included in the design, as some of the district offices have sole source agreements with specific manufacturers. Any deviation from what is described shall require approval by the Chief of Traffic Engineering or designee. Additional information on tariff lighting designs can be found in **Chapter 6**.

5.A Design Elements

5.A.1 Pole Design

No lights shall be installed on any signal equipment. In general, placement of light poles (standards) shall conform with clear zone requirements. For additional information on clear zone requirements, refer to **Chapter 4**. To facilitate good design practice, DelDOT has adopted the following standard design criteria for light poles.

5.A.1.a Type

All DelDOT owned and maintained low level light poles shall be breakaway aluminum poles. Breakaway lighting poles are designed to fail in a manner to help reduce vehicular damage when struck by a vehicle. The height and size of the light pole should be based on lighting requirements and calculations to ensure uniform illumination upon the roadway surface. Standard pole heights include 30 feet and 40 feet. All light poles should have identification tags denoting the pole number, relevant circuiting information, fixture wattage and fixture distribution. The designer should coordinate with the local district maintenance office for their preferred method of pole identification.

5.A.1.b Configuration

For larger interchanges, high mast lighting using LED light fixtures should be considered. Low level lighting shall be used for lighting installations where high mast lighting is not cost effective or is not a feasible option. Arm lengths of 8 feet, 12 feet and 15 feet are acceptable. Should the designer desire to use arm lengths greater than these, then it is required that a foundation be designed that will properly support the lighting pole and longer arm. Coordination with DelDOT maintenance personnel is necessary if other arm lengths are required. DelDOT will not maintain decorative lighting, including the luminaires and/or poles, unless it is pre-approved by the Chief of Traffic Engineering or designee.

5.A.1.c Transformer Bases

Breakaway transformer bases (T-bases) shall be used as standard for all DelDOT low level lighting installations and should meet all requirements established in the DelDOT Standard Specifications and Standard Construction Details. Larger sized transformer bases should be provided to allow easier access during initial installation, as well as any future maintenance. All transformer bases shall be grounded and installed flush to the concrete foundation, using lock nuts. The access door should be placed away from the roadway to avoid being blocked during snow removal. The designer should coordinate with the local district maintenance office for their preferred transformer base size. Transformer base details are provided in **Appendix N**.

5.A.1.d Foundations

The DelDOT standard Type 6 pole base shall be considered typical for the installation of DelDOT road level light poles. However, structural analysis should be completed for nonstandard longer arm lengths or pole heights. If soil conditions are known to be poor in the area, additional structural analysis is needed.

There is no standard for a high mast light pole foundation. As such, the foundation design for these poles shall be completed by a structural engineer and shall be coordinated with the DelDOT Bridge Section.

For poles that require foundation designs, the lighting designer shall coordinate with DelDOT's Geotechnical Engineer to determine if soil information is available for the project location. If soil data is not available for the project location, the lighting designer should submit a soil boring request to DelDOT's Geotechnical Engineer for any DelDOT projects. A sample of a soil boring request form can be found in **Appendix Y**. The number of soil borings necessary for the project should be coordinated with DelDOT's Geotechnical Engineer. The cost of the soil borings should be included in project estimates.

The information obtained during the soil analysis can be used to properly design pole bases as necessary. For any private or developer projects, the designer will be responsible for obtaining the soil boring through a third party and the signed and sealed recommendations should be sent to DelDOT for concurrence.

5.A.1.e Conduits

All underground conduit shall stub up 2" above the base plate, within the pole base. An arrow should be etched in the concrete foundation, showing the direction of conduit entry/exit. The designer can refer to DelDOT Standard Construction Details for additional information on conduit design in a lighting pole base.

5.A.2 Conduit Design

Electrical conduit is a tube that is used to protect electrical wiring from being damaged. It can be installed underground, mounted to a structure, or installed in a structure. Conduit is used to protect all wiring installed for a lighting system, starting at the power source, running out to the cabinet, and then continuing on to carry wiring out to the lights. The term 'Lighting Service Run' can be used to refer to the conduit carrying the cables from the power source location to the lighting cabinet. The general term 'Conduit' is used to describe the cable protection from the cabinet out to the lights in the system.

The following conduit sizes and requirements shall be considered standard for all DelDOT lighting projects. Conduit fill calculations should always be performed to ensure that the necessary quantity of wires does not exceed the allowable conduit fill.

5.A.2.a Sizes

For information on the minimum conduit sizes for specific design conditions, see **Table 10** below.

Table 10 – Minimum Conduit Sizes

Junction Well to Junction Well	4" Diameter Minimum
Junction Well to Light Pole Base	3" Diameter Maximum
Light Pole Base to Light Pole Base	3" Diameter Maximum
Electrical Service (Lighting Service Run)	2" Diameter Minimum
Type R Cabinet to Junction Well	(4) 4" Diameter Conduits Minimum
Type M Cabinet to Junction Well	(4) 2.5" Diameter Conduits Minimum

5.A.2.b Installation Methods

For information on conduit types based on standard conduit installation methods, see **Table 11** below.

Table 11 – Standard Conduit Types

Schedule 80 PVC Conduit	Used for all trenched and open cut conduit installations. Traceable warning tape should be buried 6" below grade, above the conduit location.
Schedule 80 HDPE Conduit	Used for boring and/or directional drilling installations.
Rigid Galvanized Steel (RGS) Conduit	Used for all exposed conduit. Used for all lighting service runs between the power source and the lighting cabinet.
Flexible Metallic Liquid Tight Conduit	Used as necessary.

5.A.2.c Conduit Fill Calculations

Proper conduit fill calculations shall be performed on each conduit in the DelDOT lighting system to ensure conformance with NEC requirements. Additionally, the designer should consult with the local district M&O office to see if there is a possibility for future expansion of the lighting system as this could require larger and/or additional conduit to support the future expansion. Generally, allowable conduit fill for DelDOT lighting conduits should be 26% for new conduit and 35% for existing conduit. To assist the designer in these calculations, **Table 12** provides the approximate total area of typical USE-2 conductor cable:

Table 12 – Type USE-2 Approximate Cable Area

#8 AWG	0.0835 in^2
#6 AWG	0.1041 in^2
#4 AWG	0.1333 in^2
#3 AWG	0.1521 in^2
#2 AWG	0.1750 in^2
#1 AWG	0.2660 in^2
#1/0 AWG	0.3039 in^2
#2/0 AWG	0.3505 in^2
#3/0 AWG	0.4072 in^2
#4/0 AWG	0.4754 in^2

In addition, **Table 13** details the specific allowable fill capacity for different conduit sizes:

Table 13 – Fill Capacities of Typical Conduit Sizes (Schedule 80 PVC)

2.0" Conduit	26% Fill	0.75 in^2
	35% Fill	1.01 in^2
2.5" Conduit	26% Fill	1.07 in^2
	35% Fill	1.44 in^2
3" Conduit	26% Fill	1.68 in^2
	35% Fill	2.26 in^2
4" Conduit	26% Fill	2.93 in^2
	35% Fill	3.94 in^2

A voltage drop/conduit fill calculation spreadsheet is provided in **Appendix Z**.

5.A.3 Junction Wells

DelDOT has several junction wells, of different sizes and configurations, to be used for lighting systems. To facilitate cable pulling, lighting system junction wells should be spaced no more than 250' apart. All metal junction well lids must be properly grounded. Circuit splicing should be done in the light pole transformer base whenever possible. In general, splicing in the junction well should only be done if it is absolutely necessary. If splicing must occur within a junction well, watertight splice kits shall be used. Composite or concrete polymer junction wells shall not be used in the lighting system unless approved by the Chief of Traffic Engineering or designee.

5.A.3.a Types

For information on junction wells, including design locations, see **Table 14** below.

Table 14 – Standard Junction Well Types

Type 4	Should be used at the following locations: • First junction well at the lighting control center. • Where a lighting conduit is installed beneath the roadway, a junction well should be installed on each side of the roadway. • At locations where more than four conduits or more than 13 wires (12 conductors plus ground) are entering a junction well.
Type 1	Should be used for all other situations where a Type 4 junction well is not necessary, including: • At light poles where more than three circuits pass through the transformer base. In this case, a Type 1 junction well should be installed adjacent to the pole, with (2) conduits run from junction well to pole base.

5.A.3.b Location

Junction wells should be installed outside of the roadway, curb ramps, shared use paths and sidewalks whenever possible. Additionally, it is important to install the junction well outside of drainage ditches or low-lying areas to avoid ingress of water into the conduit and wiring system.

5.A.4 Traffic Control During Construction

A lighting designer needs to consider the extent of temporary traffic control necessary to construct the project. The designer should refer to Part 6 of the Delaware Manual on Uniform Traffic Control Devices (MUTCD) and coordinate with Traffic Safety to determine the proper Maintenance of Traffic (MOT) setups for the project, most often in the form of Typical Applications. For lighting designs that are incorporated into a larger construction project or a developer project, the MOT of the lighting installation is typically incorporated into the MOT of the overall project.

Pedestrian and bicycle access during construction must be considered by the lighting designer, and any pedestrian or bicycle MOT plans need to be finalized and approved by Traffic Safety before handing the project off to Construction.

If the project requires lane closures, then the designer needs to contact the Safety Section to determine any time restrictions before handing the project off to Signal Construction. If the lighting work is part of

a larger project, then time restrictions set for the project contractor typically apply to the lighting contractor. If the project requires night work, the designer needs to note this on the handoff form and the plan set. Additional maintenance of traffic and safety considerations are identified on the Work Hour Restrictions Checklist, which shall be included as part of the Handoff Package. Copies of the Work Hour Restriction Checklists are provided in **Appendix T**.

5.B Electrical Elements

5.B.1 Electrical Service

The lighting designer shall be responsible for coordinating with the utility company for electrical service. Coordination should occur early in the design process to ensure that there is adequate time for the utility company to advance through their process of providing power for the proposed lighting installation. Underground or overhead electrical service may be provided and should be tapped from the nearest utility pole(s) or electrical manhole(s) able to provide sufficient power to the lighting system.

In general, 120/240 Volt, single phase, three wire service is preferred for all lighting designs, especially for smaller intersections. For larger interchanges, 277/480 Volt, three phase, 4 wire service may be requested if it is available in the vicinity of the project and the lighting design would benefit from a higher voltage. However, the designer could consider the possibility of providing several smaller 120/240 Volt services, in lieu of one 277/480V. The design should coordinate with the utility company to reduce construction and maintenance costs. Other types of electric services shall not be permitted.

For Type A projects (Capital) the utility power request should be coordinated by the Signal Construction Group. For Type B and Type C projects (Traffic Lead) the designer should establish whether utility power request should be coordinated by the Signal Construction Group or Traffic Design Group.

A fused safety switch, in a weatherproof enclosure, shall be provided on the load side of the service for all lighting services unless otherwise directed. This switch shall act as a means to disconnect the utility company's equipment and the meter. All equipment upstream of the meter shall be owned and maintained by the utility company. For 277/480V service an additional disconnect is required on the line side. For lighting designs where the control cabinet is located more than 50' from the power source or where a disconnect is not easily accessible, then an additional secondary disconnect is required.

All underground conduit shall transition to Rigid Galvanized Steel (RGS) before transitioning up to the fused safety switch. A detail showing this transition can be found in **Appendix N**.

Detailed information should be provided on the plans for all electrical service equipment. The design should provide, at a minimum, the station/offset and owner name for all equipment, and pole number for any utility poles used in the design.

5.B.2 Control Cabinet

A lighting control cabinet will house the lighting system, including the main and secondary circuit breaker. A smaller lighting system should use a smaller cabinet. Larger lighting systems will require a larger cabinet based on the required electrical loads. The main circuit breaker size should be selected based on the total load of the lighting system, as well as to account for any possible future expansion of the lighting system.

All lighting systems should make use of a central photocell installed at the control cabinet. Photocells installed on each luminaire in the system shall not be permitted unless the Chief of Traffic Engineering or designee grants approval. To prevent vandalism, the photocell should be installed inside the lighting control cabinet, with a clear, protective window (such as plexiglass) in the correct direction to allow the photocell to operate as intended. The lighting designer should coordinate with the local district M&O to determine their preference and/or requirements for any sole source equipment as well.

5.B.2.a Types & Sizes

The following lighting control center main breaker sizes shall be used on DelDOT lighting installations. Any deviation of these main breaker sizes shall not be permitted without the approval of the Chief of Traffic Engineering or designee:

- 60A Lighting Control Center (Pedestal Mounted)
- 100A Lighting Control Center

A detail of a 60A lighting control center (pedestal mounted) has been provided in **Appendix N**.

Standard 100A lighting control cabinets are as follows (see DelDOT's Standard details for dimensions and additional information):

- Type P/R – Typically used for interchange lighting systems.
- Type M – Typically used for intersection lighting systems.

In addition, 60A pedestal mounted lighting control cabinets are used for intersection lighting systems with loads capable of being controlled by the pedestal mounted photocell without a separate contractor and requires approval from the M&O district. Typically pedestal mounted cabinets are used for intersections with 12 light fixtures or less.

5.B.2.b Cabinet Bases & Conduits

All ground mounted lighting control centers shall be installed on a concrete pad. All conduits shall be stubbed up neatly within the cabinet enclosure, using 2" minimum PVC conduit. See DelDOT's Standard T-4 details for dimensions and additional information. Additionally, the South District requires a minimum 80"x80" concrete pad for lighting controllers in Kent and Sussex Counties.

5.B.2.c Location

Every effort should be made to locate the lighting control center outside of the clear zone. If this is not possible, proper protection should be incorporated as part of the design of the control center layout. It is important that the designer consider the accessibility to the control center site to allow maintenance personnel to safely park their work vehicles and to work on the control center as necessary. The location and size of the cabinet/control center should be identified on the plan set with station and offset information

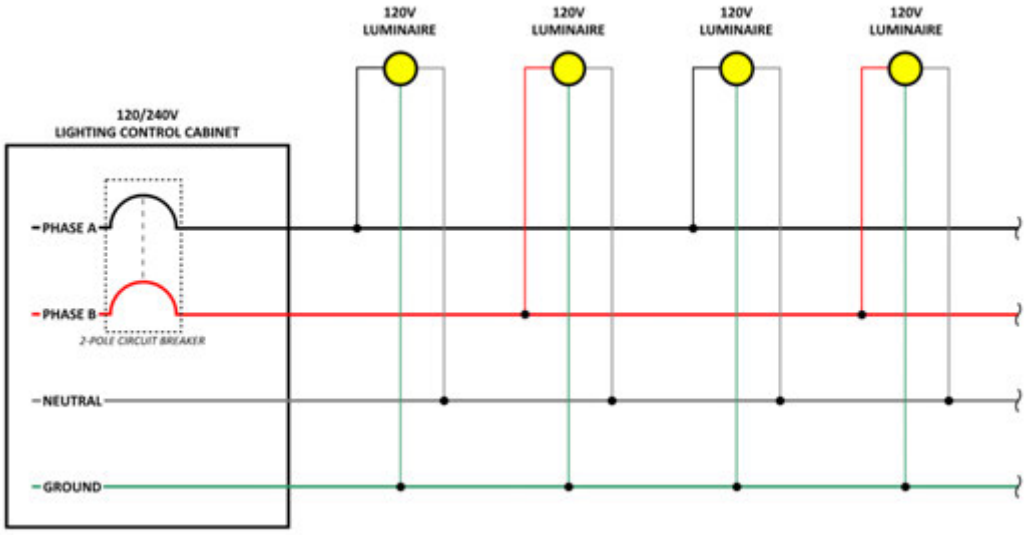
5.B.3 Circuitry

The designer should ensure that the lighting system is circuited such that all phases of the electrical system are as balanced as possible with regard to the lighting loads. For larger lighting systems,

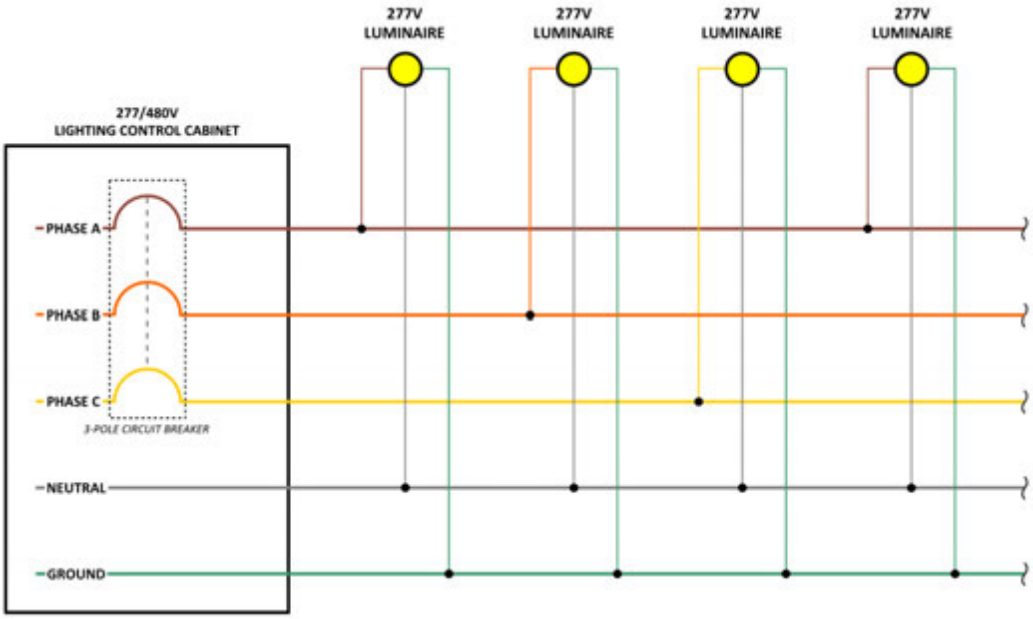
specifically if 277/480 voltage is used, alternating the phasing of luminaires along a roadway will allow for uniform power distribution. For 120V or 277V lighting, typically a shared neutral wire can be used with a common trip circuit breaker. This allows for lower voltage drop levels which in turn could allow for smaller cable sizes. The lighting designer should coordinate with the local district M&O office during their review to determine their preferences for neutral conductors and whether a shared neutral, or individual neutrals for each circuit, are to be provided.

Examples and details of typical DelDOT lighting system are illustrated below:

120/240V, Single-Phase, 3-Wire Lighting System with 120V Luminaires



277/480V, Three-Phase, 4-Wire Lighting System



5.B.4 Wiring

All wiring shall be sized in accordance with NEC requirements and conform to DelDOT's specifications. Lighting circuits shall be fully color coded for phase, neutral and ground based on the voltage of the electric service. Wire color coding should be called out by the designer, in the contract drawings. Copper Underground Service Entrance (USE-2) type wiring shall be considered the standard for all lighting circuit wiring. Standard wire colors shall be as shown in **Table 15** below:

Table 15 – Wire Color Coding

120/240V	Phase A	Black
	Phase B	Red
	Neutral	White
	Ground	Green
277/480V	Phase A	Brown
	Phase B	Orange
	Phase C	Yellow
	Neutral	White
	Ground	Green

As required by the NEC, conductors should be de-rated when there are 4 or more current-carrying conductors installed in a single conduit. Additionally, conductors should also be de-rated as required due to the expected ambient temperature and up-sized as necessary due to voltage drop.

The minimum wire size used for the phase, neutral and ground wires from the power source to the lighting cabinet shall be as listed below. Voltage drop calculations should always be performed to ensure wires are sized adequately to provide the necessary voltage to the lighting cabinet.

- #2 AWG (minimum) shall be used for all 100 Amp cabinets
- #6 AWG (minimum) shall be used for all 60 Amp cabinets

The minimum wire size used for the phase, neutral and ground wires from the cabinet out to the lighting system shall be #8 AWG. Voltage drop calculations should always be performed to ensure wires are sized adequately to provide the necessary voltage to all fixtures in the lighting system. Additionally, when it is necessary to increase the size of the conductors due to voltage drop, the ground wire should also be upsized based on NEC requirements.

5.B.4.a Grounding and Bonding

All components of the lighting system shall be properly grounded and shall comply with NEC requirements. Lighting conduit shall have a properly sized copper grounding conductor bonded into a continuous run from the source. For information on grounding requirements, see Section 833 of the DelDOT Grounding Specification as well as **Table 16** below.

Table 16 - Grounding Requirements

Lighting Conduit	All lighting conduit shall have a properly sized grounding conductor bonded into a continuous run from the source.
Light Poles Bases (When 8'-0" of Undisturbed Soil below Pole Base is Achievable)	Bonded to ground by a ¾" diameter copper ground rod embedded into undisturbed soil, below foundation as described in Section 833 of DelDOT specification.
Light Poles Bases (When 8'-0" of Undisturbed Soil below Pole Base is NOT Achievable)	Bonded to ground by a ¾" diameter exothermically weld direct buried rod end-to-end to bond lighting standards and structures as described in Section 833 of DelDOT specification.
Lighting Control Center	Minimum of two 10' x ¾" diameter copper ground rods shall be installed at lighting control centers: • One located within the cabinet base • One located at the nearest junction well location (a minimum of 6' away from the ground rod in the cabinet base) Provide a ground rod at the base of the line side safety switch (where applicable), bonded to a solid bare copper ground wire. The ground wire shall be connected to a lug in the disconnect switch and strapped to the disconnect support.
Junction Wells	Provide a 10' x ¾" diameter copper clad ground rod, bonded to ground. All metal lids must be properly bonded to ground.

5.B.4.b Power Feeders

The power feeder cable, from the utility company meter to the lighting control cabinet, should be sized according to the size of the control cabinet panel and the size of the overcurrent protection devices incorporated into the system. Copper Underground Service Entrance (USE-2) type wiring shall be considered the standard for all lighting circuit wiring. Voltage drop calculations should be performed to ensure proper feeder sizing. Additionally, any fused disconnects should be sized accordingly.

5.B.4.c Voltage Drop Calculations

Voltage drop calculations shall be performed, and submitted, for each lighting circuit of every lighting design to ensure proper voltage is reaching each luminaire in the lighting system and to properly size the lighting conductors. The maximum allowable voltage drop is 5% from the electrical service, to the last luminaire in a lighting circuit.

Voltage drop calculations shall be submitted for review as part of the Semi-Final design submission. A voltage drop/conduit fill calculation spreadsheet is provided in **Appendix Z**. Refer to **Appendix AA** for an example of how to perform voltage drop calculations by hand. To aid the lighting designer in performing voltage drop calculations, the conductor area of typical American Wire Gauge (AWG) cable sizes is provided in **Table 17** below:

Table 17 – Conductor Properties
(Area in Circular Mils)

#8 AWG	16510 cm
#6 AWG	26240 cm
#4 AWG	41740 cm
#3 AWG	52620 cm
#2 AWG	66360 cm
#1 AWG	83690 cm
#1/0 AWG	105600 cm
#2/0 AWG	133100 cm
#3/0 AWG	167800 cm
#4/0 AWG	211600 cm

6. ELECTRICAL UTILITIES

Chapter 6 ELECTRICAL UTILITIES

Most DelDOT lighting projects will require some level of coordination with the local utility company, whether for electric service or for the installation of utility owned and maintained (tariff) lighting. Delaware is primarily covered by two electrical utility companies, Delmarva Power and Delaware Electric Cooperative (DEC). There are also larger municipalities located throughout the state that own and maintain their own utilities, including electric. It is important for the designer to identify the applicable utility company early in the design process, to ensure that the communication is maintained throughout the life of a project. Contact information for most of the utilities can be found in **Appendix BB**.

6.A Design Coordination

The two aspects of lighting projects that will require utility coordination are requests for new electrical service, and requests for tariff lighting.

The lighting designer should coordinate with the utility company as early in the design process as possible. This will ensure that there is ample time to address conflicts that arise throughout the design process. The designer should contact the utility company to determine the requirements and processes for obtaining power and/or providing tariff lighting. To begin the application process, the designer needs to provide an overall site plan showing the proposed lighting. The plan should identify any lights to be mounted on utility poles, and an estimated total electrical load for power to any stand-alone lighting systems. The designer should provide additional information for clarity as necessary.

Additional support is available to the lighting designer working with Delmarva or DEC via DelDOT's monthly utility coordination meetings. Each month, there is one meeting for New Castle County and one meeting for Kent/Sussex Counties. These meetings are hosted by DelDOT's Utility groups at the local M&O facility offices or at the Dover Administration Office. The meetings provide a forum where the lighting designer can meet with representatives from the utility companies in person to discuss the utility related improvements for their project. Typically, this meeting would be sufficient for initial project coordination. Should a lighting designer need to work with one of the municipality utility companies, then they should coordinate with them directly to determine whether a field meeting would be beneficial.

Once the designer and the utility representative agree on improvements acceptable to both parties, the designer is responsible to properly display this information on their plans and share those plans with the utility company for concurrence. Follow up coordination could be necessary after the initial discussion. In some cases, the lighting designer or the utility company representative may feel that an on-site meeting would be beneficial to discuss specific project requirements, or to better estimate costs. Communication with the utility company throughout the design and construction phase is important to make sure the project is successful.

6.B Electrical Service Request

All electrical service requests will have to be agreed upon by the utility company. The designer should follow the applicable utility company's requirements for power service requests as early in the design phase as possible. An estimated total load for all lighting equipment will need to be provided so that the

utility company can assess the electric service needs and provide a service capable of handling the proposed loads.

The utility companies have pre-approved voltages that are acceptable for lighting installations (see **Chapter 5** – Lighting Design and Electrical Elements). The designer should coordinate with the utility company to determine what power voltage options are available at their project site. Typically, the voltage provided by the utility company is based on what is available near the project location. Deviating from this can result in significant costs incurred by the Department, as the utility company would need to provide a voltage that isn't readily available. For larger interchange lighting designs, the designer should consider whether several lower voltage services (120/240V) might be a better option than one higher voltage (277/480V) electric service. This determination can be accomplished by coordinating with the utility company to get cost estimates for different power source options. The lighting designer is responsible to specify the level of voltage for electric service that would be best suited to their design.

The designer should obtain from the utility company the available fault current at the proposed power service to ensure the minimum AIC (Amp Interrupting Capacity) rating is adequate for the service being provided. If the available fault current is higher than 22,000 AIC as specified in the 2016 DelDOT Standard Specifications (Section 1080), then a special provision must be created to modify the standard.

It is the designer's responsibility to ensure that all utility company requirements for the electrical service are met in the contract documents. This includes requirements for meter sockets, disconnects and ensuring that proper procedures for connecting customer owned and utility owned infrastructure are well documented. All meters and transformers should be owned and maintained by the utility company, not by DelDOT. If a pad mounted transformer must be owned and maintained by DelDOT (which will require approval by the Chief of Traffic Engineering or designee), then a DelDOT warning sticker, with DelDOT's contact information, shall be placed on the transformer so DelDOT will be contacted directly if any issues arise.

For a list of information that the designer is responsible to convey to the utility company for electric service, please see **Table 18** below:

Table 18 – Electric Power Service Information

Electric Power Services (Removals or Installations)	Utility owner (pole or manhole)
	Number (pole number or manhole ID)
	Station/Offset of power location
	Removals: Equipment currently utilizing the power source
	Installations: Equipment to utilize the power source
	Removals: Level of power source abandoned, and location
	Installations: Voltage and level of power requested

A separate DGM 1-27 for general electric service requests for DelDOT owned roadway lighting, traffic signals, and ITS equipment for Type A projects is developed by DelDOT and can also be found in **Appendix CC**.

6.C Tariff Lighting

Tariff lighting is when the utility company owns and maintains a light fixture on their utility pole. In return, the customer (DelDOT, developer, resident, business owner, etc.) will pay a monthly tariff fee

and energy rate for that fixture. The rates and fees change often based on various market adjustments. The lighting designer can consult the utility company's website to obtain the latest rates.

Where possible, DelDOT prefers utility company owned and maintained tariff lighting over DelDOT owned lighting installations, although tariff lighting is not an option along freeways or expressways. As with electrical services, all tariff lighting will need to be agreed upon by the utility company. This will include completing an application for tariff lighting and signing an agreement, following the procedures set forth by the applicable utility company. A lighting plan showing all the tariff based lighting fixtures, including utility pole numbers, shall be developed. The plan should also include a schedule that lists the station and offset (or northing and easting if a baseline is not created), the luminaire wattage equivalent, and the distribution type. Any relevant notes should also be included on the plans. All tariff lighting plans must be approved by DelDOT Traffic Section before being submitted to the power company for implementation or shared with the local M&O District. For a list of information that the designer is responsible to convey to the utility company for tariff lighting, please see **Table 19** below:

Table 19 – Tariff/Utility Owned Lighting Information

Tariff/Utility Owned Lighting (Utility Pole Lighting)	Owner of the pole(s)
	Associated pole work (removed/relocated/replaced/remain/new)
	Lighting fixture work (removed/relocated/replaced/remain)
	Pole number (removed/relocated/replaced/remain)
	Station/Offset (relocations/replaced: provide both existing and proposed station/offset)
	For replaced/new fixtures: fixture information (type, wattage, distribution, etc.)
	For replaced/relocated/new fixtures: mounting height (or range)
Tariff/Utility Owned Lighting (Stand-alone Lighting)	Owner of the pole(s)
	Associated pole work (removed/relocated/replaced/remain/new)
	Lighting fixture work (removed/relocated/replaced/remain/new)
	Pole number (removed/relocated/replaced/remain)
	Station/Offset (relocations/replaced: provide both existing and proposed station/offset)
	For replaced/new fixtures: fixture information (type, wattage, distribution, etc.)
	For replaced/relocated/new fixtures: mounting height (or range)
	Level of power requested
	Equipment to utilize the power source

Utility companies can provide many different types of luminaires, including LED fixtures of different wattages and distributions. Typically, the utility company can provide the designer with the fixture codes for the light fixtures they stock. The designer can then search the vendor's website with the code information to find the IES file to use for photometric calculations. The lead times for procuring certain light fixtures can be extensive, so it is important to begin the coordination process with the utility company as early as possible in the design, especially regarding the type of fixture.

If utility poles don't exist within the project limits, but the lighting design would only require a few poles, the lighting designer can explore if the utility company can provide wooden utility poles solely for the purpose of tariff lighting. This is a more feasible option for projects that will require new utility pole relocations. This option typically involves increased costs for utility work, but the lighting designer is responsible to determine if it could outweigh the option of a DelDOT owned and maintained lighting system.

6.D Utility Coordination

The lighting designer is responsible to clearly convey the equipment upgrades the project will require of the utility company. For Type A (Capital) projects, this information is incorporated into the utility statement. The utility statement details the utility improvements for the project, including electric, cable, water, gas, etc. The statement identifies which utility company is responsible to perform what work, and an estimate for how long that work will take. The lighting designer is responsible to make sure that the lighting equipment needs are included in the utility statement. For Type B or C (Traffic Lead) projects, a formal utility statement is not required, but the lighting designer should document the utility information in a separate list and include the information on the plan sheets. Utility information the designer should note for their project was previously listed in **Table 18** and **Table 19** from Section 6.B and Section 6.C, respectively.

Formal applications must also be completed for power service and tariff lighting requests. DelDOT has developed their own application for power service that lighting designers should complete when applying for power services. A copy of this application has been included in **Appendix DD**. DelDOT's Traffic Signal Construction section will prepare and submit the power service application to the utility company. Traffic personnel handling these requests can be confirmed through the Traffic Field Operations. For large and complex projects, where there are more than two power service requests, a display map showing all the power source locations and the type of service should be provided by the designer and will be part of the utilities service application. See DGM 1-27 for additional information.

For some Type A projects, the General Contractor would handle the coordination with the utility company. For Type B or C (Traffic Lead) projects, coordination with the utility company is project specific, and would be handled by either the designer, the Traffic Design Group or Signal Construction. In these cases, the designer is responsible to verify which group will handle the coordination.

Some utility companies may require that the lighting designer complete an additional application form, that is unique to that utility company. It is the lighting designer's responsibility to determine if the utility they are coordinating with requires this. These unique utility forms can typically be used to apply for both power sources and for tariff lighting requests.

The lighting designer is responsible to coordinate with the utility company to obtain quantities and cost estimates for the work the utility company will complete for the project. The designer should include these costs in their overall project cost estimate. For Type A projects, utility costs will be reflected through the general bid, and any tariff related charges for equipment installations will be paid separately. For Type B/C projects, utility costs should be included as part of the traffic statement. The designer should coordinate directly with the utility company as necessary to obtain costs prior to project handoff.

Delaware Department of Transportation's Traffic Lighting Policy

List of Appendices

A. DelDOT Lighting Design Manual – Traffic Systems Design Directive
B. Lighting Request Flow Chart
C. Roles and Responsibilities for Lighting Projects
D. Memorandum – 'Guidance on Retrofitting Existing HPS Lighting Fixtures with LED Equivalents' (February 16, 2018)
E. Lighting Design Checklist
F. Standard Lighting Title Sheet
G. Sample Plan – Smaller Intersection Lighting Design
H. Sample Plan – Larger Intersection Lighting Design
I. Sample Plan – High Mast Lighting Design
J. Sample Plan – Utility Owned Lighting Design
K. Lighting Design Report
L. Sample Lighting Design Report Figure
M. Lighting Wiring Diagram Samples
    1. Smaller 120/240V System
    2. Larger 120/240V System
    3. 277/480V System
    4. Panel Schedule
N. Lighting Details
O. Sample Cost Estimate
P. Sample Lighting Technical Memorandum
Q. Traffic Systems Design Handoff Form
R. Concurrence Form
S. Environmental Clearance Example
T. Contract Work Hour Restrictions Checklist
    1. Typical Contract
    2. Open End Contract
U. Lighting Warrant Flow Chart
V. Lighting Warrant Form
W. Typical Areas of Illumination
X. Guidelines for Photometric Analysis
    1. AGi32
    2. Visual
Y. Soil Boring Request Form
Z. Voltage Drop and Conduit Fill Calculation Spreadsheet (Electronic Submission)
AA. Voltage Drop Hand Calculation Samples
BB. Utility Contact Information
CC. DGM 1-27 – 'Electric Power Service Request for Roadway Lighting, Traffic Signals and ITS Equipment'
DD. DelDOT Application for Power Service

APPENDIX A.
TRAFFIC SYSTEMS DESIGN DIRECTIVE

Traffic Systems Design Directive

169 Brick Store Landing Road, Smyrna, DE

Number (Year - #)
_____

Requestor Name: _____

Date Submitted: _____

Applicable Chapter / Section / Page Table / Figure in current manual: _____

Requires modification to Traffic Lighting Policy?
☐ Yes
☐ No

Description of Current Practice: _____

_____

_____

_____

Recommended Change: _____

_____

_____

_____

Date Received: _____ Received By: _____

Based upon the conditions presented, it is recommended that this be approved as an updated Lighting Design Practice and included as a revision to the Traffic Lighting Policy (if applicable).

Recommended By: _____ Date: _____
Requestor

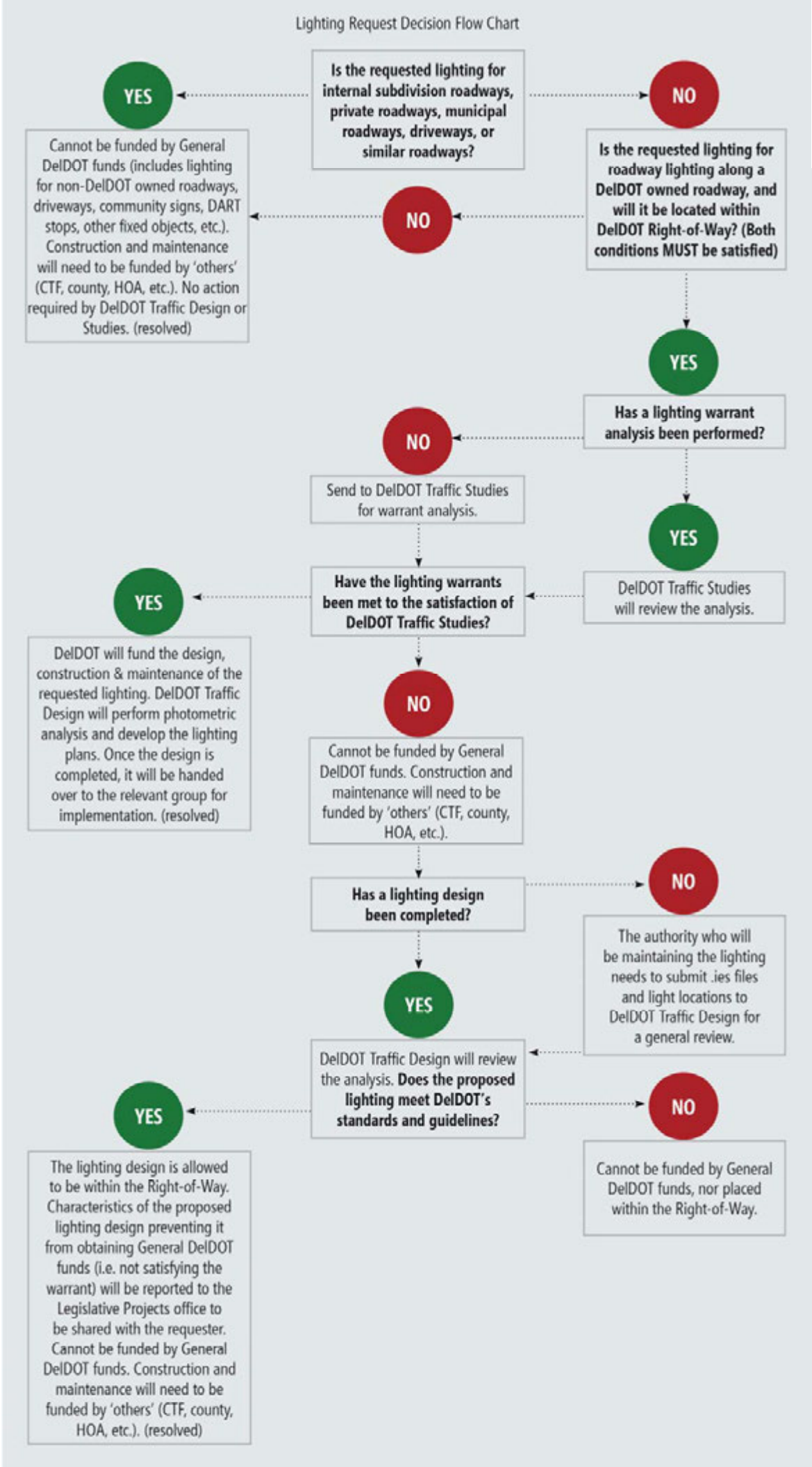
Recommended By: _____ Date: _____
Design / Construction / Safety / Studies Manager

Approved By: _____ Date: _____
(Signature)

Status / Date Completed: _____

Form Date: 04/18/2018

APPENDIX B.
LIGHTING REQUEST FLOW CHART


Lighting Request Decision Flow Chart
Is the requested lighting for internal subdivision roadways, private roadways, municipal roadways, driveways, or similar roadways?
YES
Cannot be funded by General DelDOT funds (includes lighting for non-DelDOT owned roadways, driveways, community signs, DART stops, other fixed objects, etc.). Construction and maintenance will need to be funded by 'others' (CTF, county, HOA, etc.). No action required by DelDOT Traffic Design or Studies. (resolved)
NO
Is the requested lighting for roadway lighting along a DelDOT owned roadway, and will it be located within DelDOT Right-of-Way? (Both conditions MUST be satisfied)
NO
YES
Has a lighting warrant analysis been performed?
NO
Send to DelDOT Traffic Studies for warrant analysis.
YES
DelDOT Traffic Studies will review the analysis.
Have the lighting warrants been met to the satisfaction of DelDOT Traffic Studies?
YES
DelDOT will fund the design, construction & maintenance of the requested lighting. DelDOT Traffic Design will perform photometric analysis and develop the lighting plans. Once the design is completed, it will be handed over to the relevant group for implementation. (resolved)
NO
Cannot be funded by General DelDOT funds. Construction and maintenance will need to be funded by 'others' (CTF, county, HOA, etc.).
Has a lighting design been completed?
NO
The authority who will be maintaining the lighting needs to submit .ies files and light locations to DelDOT Traffic Design for a general review.
YES
DelDOT Traffic Design will review the analysis. Does the proposed lighting meet DelDOT's standards and guidelines?
YES
The lighting design is allowed to be within the Right-of-Way. Characteristics of the proposed lighting design preventing it from obtaining General DelDOT funds (i.e. not satisfying the warrant) will be reported to the Legislative Projects office to be shared with the requester. Cannot be funded by General DelDOT funds. Construction and maintenance will need to be funded by 'others' (CTF, county, HOA, etc.). (resolved)
NO
Cannot be funded by General DelDOT funds, nor placed within the Right-of-Way.

APPENDIX C.
ROLES AND RESPONSIBILITIES FOR LIGHTING PROJECTS

Roles and Responsibilities for Lighting Projects

DelDOT's Traffic Section ("Traffic")

- Responsible for all lighting design projects on state maintained roadways in the State of Delaware for which the equipment will be owned, maintained, or funded by DelDOT.
- Responsible for the review of lighting projects that will be installed on state maintained roadways.
- All lighting plans must be reviewed and/or approved by the Chief Traffic Engineer, Systems Design Manager, or designee.
- The Traffic Section has two components: Traffic Engineering and Traffic Management & Operations. Traffic Engineering is made up of multiple groups, which include the Traffic Studies Group, the Traffic Systems Design Group, and the Traffic Field Operations Group. Traffic Management and Operations is made up of Traffic Safety and the TMC.

DelDOT's Traffic Studies Group ("Studies" or "Traffic Studies")

- Responsible for investigating lighting requests to determine if lighting is warranted.
- The Studies group is only responsible for investigating lighting requests that are on state-maintained facilities, outside of subdivisions.
- May make recommendations for possible lighting improvements as part of the Highway Safety Improvement Program (HSIP) or other studies.

DelDOT's Traffic Systems Design Group ("Design" or "Traffic Design")

- Completes lighting system designs by coordinating with DelDOT sections, consultants, contractors, and utility companies, as necessary.
- Handles review of designs developed outside of the department.
- Recommends approval of completed lighting design projects to the Chief Traffic Engineer.
- Develops or reviews specifications and cost estimates for designs.
- Reviews and approves lighting 'as-built' plans.

DelDOT's Traffic Field Operations Group ("Construction" or "Traffic Construction")

- Handles the installation, construction coordination, and inspection of state-owned lighting devices.
- Once a lighting project is awarded or handed off, Construction supports the project by coordinating with the Contractor, the local maintenance District, and utility companies through all phases of construction.
- Monitors lighting construction activity throughout the state for Type A projects.

DelDOT's Traffic Safety Group ("Safety" or "Traffic Safety")

- Responsible for reviewing, preparing or approving maintenance of traffic (MOT) plans, work zone safety, work hour restrictions, MOT monitoring during construction, or detour plans, as necessary for lighting projects.

DelDOT's Maintenance and Operations (M&O) Groups ("Maintenance" or "Maintenance & Operations")

- Each local M&O district (North, Canal, or South) handles the maintenance and upkeep of existing DelDOT-owned lighting systems within their District.
- Handle upgrades to wiring, lighting fixture replacement, knock-down repairs, minor upgrade projects, etc.

- Provide assistance during construction, as needed.
- Review proposed lighting systems and shop drawings from a maintenance perspective.
- Handle acceptance of all constructed state-owned lighting equipment.
- Monitor lighting construction activity throughout the state for Type B/C projects.
- Update the Road Lights Database in Maximo, which is displayed via Google Earth.

DelDOT's Project Development Section

- Leads the design of all roadway construction projects in Delaware.
- Traffic supports Capital Projects as necessary when lighting designs are included in a project scope.

DelDOT's Bridge Section

- Involved in designs that include structure work in Delaware.
- Responsible for the inspection of high mast lights.
- Should be included on any inquiries for bridge lighting designs or changes to existing bridge lighting.

DelDOT's Utility Section

- Responsible for any reimbursable utility work for DelDOT projects.
- Organize monthly utility coordination meeting with all utility companies. Each month, one meeting for New Castle County and one meeting for Kent/Sussex Counties.
- Support and guide light designers for utility coordination, as necessary.

DelDOT's Community Relations Section

- Responsible for DelDOT's public outreach.
- Needs to be informed of new lighting construction projects.

DelDOT's Legislative Projects Section

- Handles requests for lighting from the Community Transportation Fund (CTF).
- Shares CTF requests with Studies Group.
- Coordinates with the local legislators regarding lighting requests.

Consultant

- In lieu of performing a lighting design in-house, DelDOT may request that a private engineering company (consultant) prepare lighting plans and/or supporting documents. In these cases, the Consultant is responsible for all data collection and design activities related to that project.
- Responsible for any project-related coordination with the various DelDOT sections and outside agencies for the life of the project.

Power Company

- The local power company provides electrical service to lighting systems.
- If a lighting design is best suited to utilize utility-owned fixtures, then coordination with the local power company is needed to determine acceptable locations.
- Coordination with the power company is necessary to resolve potential aerial line conflicts during design.

MISS UTILITY

- MISS UTILITY is an agency separate from DelDOT.
- Responsible for locating underground utilities on both state and local roadways.

Local Governments

- Includes either municipalities, cities, or counties that may have an operational/safety/aesthetic interest, financial interest or obligation, or other responsibilities for a lighting project.
- Lighting designers must coordinate with local governments to determine local guidelines and ordinances that are applicable to lighting projects, such as equipment specific differences.
- If a local government agrees to own or maintain a proposed lighting system, the design can follow the local government's standards as long as the illumination and safety criteria of this Policy are met.
- If lighting projects are located within a municipality or city limits, the designer must follow these criteria:
    1) Local government must be notified of the lighting project during design. The designer should determine if the local government will require involvement during the design process, including review.
    2) If the project includes changes to any lighting not owned by DelDOT, then an updated agreement with the local government may be necessary.
    3) If an agency outside of the municipality installs new lighting equipment within the limits of the municipality, but intends to have the municipality take over ownership and future maintenance of the lighting equipment, then an agreement between the agency and the municipality is necessary to document the future ownership and maintenance responsibilities.

APPENDIX D.
MEMORANDUM – ‘GUIDANCE ON RETROFITTING EXISTING HPS LIGHTING FIXTURES WITH LED EQUIVALENTS’ (FEBRUARY 2018)

STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
800 BAY ROAD
P.O. BOX 778
DOVER, DELAWARE 19903

JENNIFER COHAN
SECRETARY

MEMORANDUM

TO: Mark Alexander
Director of Maintenance & Operations

FROM: Max Saintil MS
Traffic Systems Design Engineer

DATE: February 16, 2018

SUBJECT: Guidance on Retrofitting Existing HPS Lighting Fixtures with LED Equivalents

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Due to recent advancements in lighting technology, Light Emitting Diode (LED) fixtures have become a viable option for roadway lighting. DelDOT initiated a study in 2016, which evaluated LED lighting systems to determine if their results could be comparable to existing High Pressure Sodium (HPS) lighting systems. Based on the results, in June 2017 DelDOT released a memo that formally directed that LED lighting be installed for all DelDOT projects.

DelDOT's Division of Maintenance and Operations (M&O) is responsible for replacing existing lighting fixtures that have exceeded their service life. As a result of the memo, existing fixtures will now be replaced with comparable LED fixtures. Unfortunately, LED lighting fixtures produced by different manufacturers will never be the same. Also, selecting an appropriate LED fixture to replace an existing HPS fixture without performing any photometric analysis is not an easy task. It is not reasonable that photometric calculations be performed each time an existing HPS fixture needs to be replaced by an LED fixture. With these constraints in mind, a study was initiated by the DelDOT Traffic section to find equivalent LED fixtures that could replace existing HPS fixtures. As part of this study, detailed photometric calculations were performed on LED fixtures from multiple manufacturers using the AGi32 Roadway Optimizer software. Various scenarios were set up to test the photometric results from the different fixtures, including assorted mounting heights and fixture spacing's. The testing resulted in a list of LED fixtures that DelDOT's M&O staff can utilize for existing fixtures replacement.

A summary of the results of this study is shown in the table below. The table provides a general comparison of 400 Watt, 250 Watt and 150 Watt HPS fixtures, along with their LED equivalents. This table is further broken down to include detailed information for the LED fixtures, such as their wattage, lumens, drive current, and color temperature. The summary table also includes a section for 'Other' LED Luminaire, which displays the required parameters that have to be satisfied, should the user choose to select a different manufacturer or fixture.

The intent of this table is to provide guidance on one-to-one replacement of existing HPS fixtures only as requested by DelDOT M&O staff, as well as other municipalities who maintain their own lighting. If new lighting equipment is to be installed with any new construction or reconstruction projects, a photometric analysis would be required to determine optimized light fixture spacing and photometric values.

cc: Mark Luszcz, Assistant Director / Chief Traffic Engineer

Retrofitting Table for LED Fixtures

LED Luminaires - 400 Watt HPS Equivalent

Cooper NAV-AF-06-D-UNV-SL2-800			
Wattage	Lumens	Drive Currnt	Color Temperature
249	28,532	800mA	4000K

Philips RFL-241W112LED4K-G2-R2M-UNV			
Wattage	Lumens	Drive Current	Color Temperature
243	30,527	700mA	4000K

AEL Autobahn ATB2-80BLEDE85-MVOLT-R2			
Wattage	Lumens	Drive Current	Color Temperature
214	27,086	850mA	4000K

'Other' LED Luminaire 400 Watt HPS Equivalent			
Wattage	Lumens	Drive Current	Color Temperature
250 (Maximum)	27,000-31,000	850mA (Maximum)	3,000K-4,500K

LED Luminaires - 250 Watt HPS Equivalent

Cooper NAV-AF-04-D-UNV-SL2-800			
Wattage	Lumens	Drive Currnt	Color Temperature
171	19,324	800mA	4000K

Philips RFL-145W64LED4K-G2-R2M-UNV			
Wattage	Lumens	Drive Current	Color Temperature
137	17,444	700mA	4000K

AEL Autobahn ATB2-60BLEDE70-MVOLT-R2			
Wattage	Lumens	Drive Current	Color Temperature
130	18,193	700mA	4000K

'Other' LED Luminaire 250 Watt HPS Equivalent			
Wattage	Lumens	Drive Current	Color Temperature
175 (Maximum)	16,000-20,000	850mA (Maximum)	3,000K-4,500K

LED Luminaires - 150 Watt HPS Equivalent

Cooper NAV-AF-02-D-UNV-SL2-800			
Wattage	Lumens	Drive Currnt	Color Temperature
85	9,648	800mA	4000K

Philips RFM-80W48LED4K-G2-R2M-UNV			
Wattage	Lumens	Drive Current	Color Temperature
81	10,077	530mA	4000K

AEL Autobahn ATB2-40BLEDE70-MVOLT-R2			
Wattage	Lumens	Drive Current	Color Temperature
88	11,607	700mA	4000K

'Other' LED Luminaire 150 Watt HPS Equivalent			
Wattage	Lumens	Drive Current	Color Temperature
90 (Maximum)	8,000-12,000	850mA (Maximum)	3,000K-4,500K

General Notes:

1. This table does not apply to roadways wider than four lanes.
2. Performance evaluation does not include service life cost comparisons.
3. Distribution Type (II, III) for existing HPS fixtures does not affect the appropriate LED choice.
4. It is suggested that the statewide lighting database be reviewed and updated prior to any LED replacements.
5. This table satisfies the requirements of the 'LED Luminaire - 150/250/400 Watt Equivalent' specifications.

Updated Retrofitting Table for LED Fixtures

LED Luminaires - 400 Watt HPS Equivalent				LED Luminaires - 250 Watt HPS Equivalent				LED Luminaires - 150 Watt HPS Equivalent			
Lumec RFL-215W96LED-4K-G2-R2M-UNV				Lumec RFL-145W64LED-4K-G2-R2M-UNV				Lumec RFM 80W48LED-4K-G2-R2M-UNV			
Wattage	Lumens	Drive Current	Color Temperature	Wattage	Lumens	Drive Current	Color Temperature	Wattage	Lumens	Drive Current	Color Temperature
207	28,742	700mA	4000K	137	19,162	700mA	4000K	81	11,153	530mA	4000K
AEL Autobahn ATB2-80BLEDE85-MVOLT-R2				AEL Autobahn ATB2-60BLEDE70-MVOLT-R2				AEL Autobahn ATB2-40BLEDE70-MVOLT-R2			
Wattage	Lumens	Drive Current	Color Temperature	Wattage	Lumens	Drive Current	Color Temperature	Wattage	Lumens	Drive Current	Color Temperature
214	27,086	850mA	4000K	130	18,193	700mA	4000K	88	11,607	700mA	4000K
'Other' LED Luminaire 400 Watt HPS Equivalent				'Other' LED Luminaire 250 Watt HPS Equivalent				'Other' LED Luminaire 150 Watt HPS Equivalent			
Wattage	Lumens	Drive Current	Color Temperature	Wattage	Lumens	Drive Current	Color Temperature	Wattage	Lumens	Drive Current	Color Temperature
250 (Maximum)	27,000-31,000	1050mA (Maximum)	3,000K-4,000K	175 (Maximum)	16,000-20,000	1050mA (Maximum)	3,000K-4,000K	90 (Maximum)	8,000-12,000	1050mA (Maximum)	3,000K-4,000K

General Notes:

1. This table does not apply to roadways wider than four lanes.
2. Performance evaluation does not include service life comparisons.
3. Distribution Type (II, III) for existing HPS fixtures does not affect the appropriate LED choice.
4. It is suggested that the statewide lighting database be reviewed and updated prior to any LED replacements.
5. This table satisfies the requirements of the 'LED Luminaire - 150/250/400 Watt Equivalent' specifications.

APPENDIX E.
LIGHTING DESIGN CHECKLIST

Lighting Design / Modification Request Form

169 Brick Store Landing Road, Smyrna, DE

This form, as well as the attached Lighting Design Checklist, should be completed for all new lighting systems and for all existing lighting systems requiring design modifications on state-maintained highways in the state of Delaware.

Location: _____

_____

County: _____

Lighting: ☐ New (Proposed)

☐ Existing (Location Description: _____)

If **new,** lighting warrants met:

- ☐ Warranted as per Flow Chart
- ☐ Warranted as per Evaluation Form (attach form)
- ☐ Warranted as per Special Condition (attach additional information)

If **existing**, proposed changes:

- ☐ Equipment Upgrades
- ☐ Service Upgrades
- ☐ Other _____

Requested By: _____ **Date:** _____

Recommended By: _____ **Date:** _____
(DelDOT / Consultant) (Circle One)

Approved By: _____ **Date:** _____
(DelDOT Chief Traffic Engineer or Designee)

Lighting Plan Review Checklist (attached)

Completed By: _____ **Date:** _____
(DelDOT / Consultant) (Circle One)

Checked By: _____ **Date:** _____
(DelDOT)

Approved By: _____ **Date:** _____
(DelDOT)

DELDOT LIGHTING PLAN REVIEW CHECKLIST

	Yes	No	N/A	Comments
The following items are included and shown correctly on the Plan Sheets:				
• Existing and proposed conditions (Only pertinent information should be shown on plans. All other levels should be turned off.)	☐	☐	☐	
• Limits of work	☐	☐	☐	
• Base mapping	☐	☐	☐	
• North arrow	☐	☐	☐	
• Correct scale	☐	☐	☐	
• Baseline	☐	☐	☐	
• Matchlines	☐	☐	☐	
• Consultant logo	☐	☐	☐	
• Legend	☐	☐	☐	
• Right-of-way lines and labels (existing and proposed)	☐	☐	☐	
• Permanent striping shown	☐	☐	☐	
• Equipment within Right-of-Way	☐	☐	☐	
• Overhead utilities (heights indicated)	☐	☐	☐	
• General Notes	☐	☐	☐	
• Street names	☐	☐	☐	
• Route numbers with cardinal direction (e.g. I-70 (WBL)) and road names	☐	☐	☐	
• Current borders / signature / revision block	☐	☐	☐	
• Project specific details (if required)	☐	☐	☐	
• Circuit diagram included	☐	☐	☐	
Existing Lighting Information (Properly Identified or Noted)				
• Existing lighting plans have been verified	☐	☐	☐	
• Site characteristics have been inventoried and examined	☐	☐	☐	
• Existing lighting equipment to be removed is noted	☐	☐	☐	
Proposed Lighting Information (Properly Identified or Noted)				
• Appropriate lighting structures and foundations	☐	☐	☐	
• Appropriate lighting structure configuration / placement	☐	☐	☐	
o Alternative pole/foundation configurations are used where applicable	☐	☐	☐	
• Lighting controller cabinet location and type	☐	☐	☐	
o Cabinet location permits safe access by maintenance	☐	☐	☐	
o Cabinet is located near a power source (if possible)	☐	☐	☐	
o Cabinet is protected (if needed)	☐	☐	☐	
o Cabinet does not restrict driver visibility	☐	☐	☐	
• Lighting fixtures/poles are numbered and placement is correct	☐	☐	☐	
• All lighting equipment meets clear zone requirements	☐	☐	☐	

DELDOT LIGHTING PLAN REVIEW CHECKLIST

	Yes	No	N/A	Comments
• Junction wells are appropriately located	☐	☐	☐	
• Junction wells, conduit and wire are correct • size and type	☐	☐	☐	
• Availability of electrical power coordinated with utility company	☐	☐	☐	
o Power service with pole number and transformer number identified	☐	☐	☐	
o Confirm cabinet / service pedestal / electrical service equipment locations are constructible as shown	☐	☐	☐	
• Metered service pedestal	☐	☐	☐	
• Utility pole or transformer number labeled	☐	☐	☐	
o Confirm service load is available	☐	☐	☐	
• Conduit sizes accommodate fill requirements (26% maximum fill for new construction, 35% for modifications)	☐	☐	☐	
• Conduit run schedule included	☐	☐	☐	
• Lighting standard schedule included	☐	☐	☐	
• Numbering is correct	☐	☐	☐	
• Legend matches plan design	☐	☐	☐	
Maintenance of Traffic				
• Standards specified as needed	☐	☐	☐	
Other Design Considerations				
• Equipment locations do not hinder maintenance activities	☐	☐	☐	
• Equipment is installed on appropriate slopes	☐	☐	☐	
• Other facilities within the project limits with existing lighting are noted	☐	☐	☐	
• Lighting design is not in conflict with any utilities	☐	☐	☐	
• Lighting design is not in conflict with drainage	☐	☐	☐	
• Design is in accordance with Federal and DelDOT standards	☐	☐	☐	
Utilities				
• Overhead utility conflicts avoided	☐	☐	☐	
• Underground utility conflicts avoided	☐	☐	☐	
• Utility relocations coordinated	☐	☐	☐	
o Utility relocation details provided (if required)	☐	☐	☐	
• Overhead clearance callouts at cable crossing with lighting structure are provided	☐	☐	☐	
• Test hole schedule identified	☐	☐	☐	

DELDOT LIGHTING PLAN REVIEW CHECKLIST

	Yes	No	N/A	Comments
Right-of-Way				
• Adequate right-of-way is available for proposed pole locations	☐	☐	☐	
• Required right-of-way acquisitions are noted (if needed)	☐	☐	☐	
• Easement for special purpose is noted (if needed)	☐	☐	☐	
Additional Plan Sheets				
• Cover sheet	☐	☐	☐	
• Index sheet	☐	☐	☐	
• Legend sheet	☐	☐	☐	
• Project notes sheet	☐	☐	☐	

APPENDIX F.
STANDARD LIGHTING TITLE SHEET

THE STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION

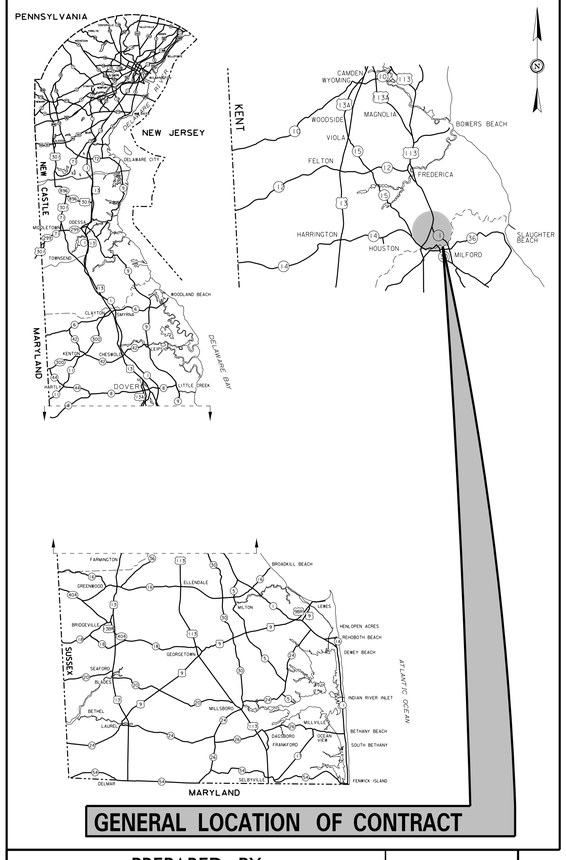
U.S. CUSTOMARY UNITS

CONSTRUCTION PLANS FOR:

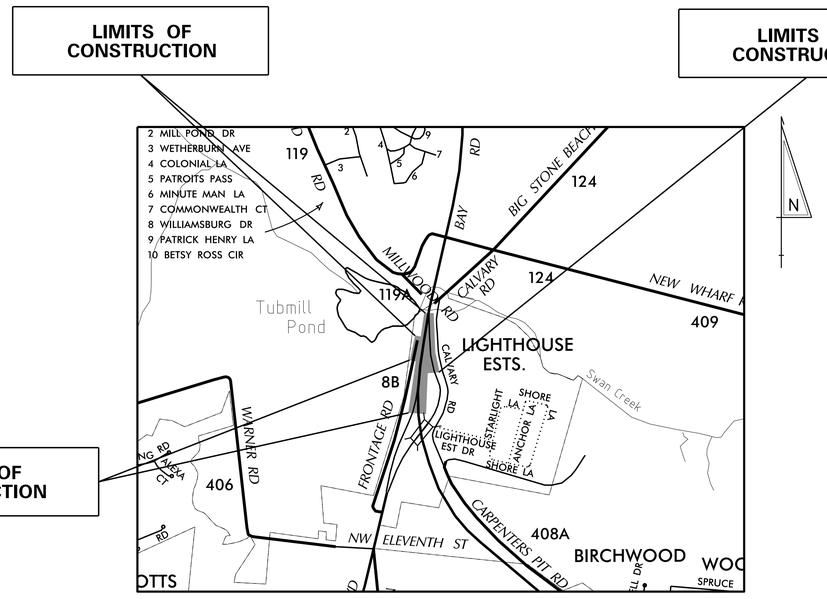
SR 1 AND US 113 SPLIT LIGHTING EVALUATION AND DESIGN

CONTRACT NUMBER: T202004001
FEDERAL AID PROJECT NUMBER:

COUNTY: KENT **M.R. #:** K8



GENERAL LOCATION OF CONTRACT



LOCATION MAP

SCALE: N. T. S.

SR 1 DESIGN DESIGNATION			
FUNCTIONAL CLASS: ARTERIAL		D.H.V. PROJECTED: N/A	YEAR: N/A
TYPE OF CONSTRUCTION: ROADWAY LIGHTING		DESIGN SPEED: N/A	
A.A.D.T. CURRENT: 25628	YEAR: 2018	TRUCKS: N/A	
A.A.D.T. PROJECTED: N/A	YEAR: N/A	DIRECTION OF DISTRIBUTION: N/A	

APPROVED DESIGN EXCEPTIONS

DESIGN PARAMETER	REQUIRED	PROVIDED	DATE

ASSOCIATED CONTRACTS

CONTRACT NO.	CONTRACT NAME

APPROVED FOR ADVERTISEMENT

CHIEF OF TRAFFIC ENGINEERING _____ DATE _____

PREPARED BY
JMT

THIS SEAL APPLIES TO ALL SHEETS BEARING THE "JMT" SECTION DESIGNATION.

DATE

SEAL

PLOTTED BY: KREHM DATE: 4/16/2020
FILE LOCATION: Q:\2017\1713205_602_SR_1_AND_US_113_SPLIT\CADD\TC.DGN [SHEET: TC01]

APPENDIX G.
SAMPLE PLAN – SMALLER INTERSECTION LIGHTING DESIGN

1. Cedar Lane Rd and Marl Pit Rd Intersection Improvements
2. US 40 from Church Rd/Wellington Rd to Rockwood Rd

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	STATION	OFFSET	ARM	HEIGHT	LIGHT STANDARD
1	A	510+64	40.6' R	12'	40'	NAV-AF-04-D-UNV-SL3-800, 171W LED LUMINAIRE
2	B	426+22	50.3' L	12'	40'	NAV-AF-04-D-UNV-SL3-800, 171W LED LUMINAIRE
3	A	427+45	43.4' R	12'	40'	NAV-AF-04-D-UNV-SL3-800, 171W LED LUMINAIRE
4	B	514+57	46.2' R	12'	40'	NAV-AF-04-D-UNV-SL3-800, 171W LED LUMINAIRE
5	A	513+33	51.4' R	12'	40'	NAV-AF-04-D-UNV-SL3-800, 171W LED LUMINAIRE
6	B	424+13	41.7' R	12'	40'	NAV-AF-04-D-UNV-SL3-800, 171W LED LUMINAIRE

LIGHTING STANDARD STATIONS AND OFFSETS ARE TO CENTER OF POLE BASE.

LEGEND

SYMBOL	DESCRIPTION
CA X	PROPOSED LIGHTING CONTROL CABINET AND CABINET IDENTIFIER (TYPE OF CABINET)
LSR X	PROPOSED LIGHTING SERVICE RUN AND LIGHTING SERVICE RUN IDENTIFIER (# OF LIGHTING SERVICE RUN)
JW X	PROPOSED JUNCTION WELLS AND JUNCTION WELL IDENTIFIER (TYPE OF JUNCTION WELL)
LST X	PROPOSED LIGHTING STANDARD AND POLE BASE (# OF LIGHTING STANDARD)
PB X	PROPOSED POLE BASE IDENTIFIER (TYPE OF POLE BASE)
P	PROPOSED SERVICE PEDESTAL

LIGHTING SERVICE SCHEDULE

SERVICE RUN	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
1	22.0'	(3)#2 + (1)#2 GND IN 2" GALVANIZED CONDUIT	DIRECT BURIAL
2	28.0'	(3)#6 + (1)#6 GND IN 4" SCH 80 PVC CONDUIT	DIRECT BURIAL
3	27.0'	(2)#6 + (1)#6 GND IN 4" SCH 80 PVC CONDUIT	DIRECT BURIAL
4	41.0'	(2)#6 + (1)#6 GND IN 3" SCH 80 PVC CONDUIT	DIRECT BURIAL
5	101.0'	(3)#6 + (1)#6 GND IN 4" SCH 80 PVC CONDUIT	DIRECT BURIAL
6	121.0'	(2)#6 + (1)#6 GND IN 3" SCH 80 PVC CONDUIT	DIRECT BURIAL
7	94.0'	(2)#6 + (1)#6 GND IN 4" SCH 80 PVC CONDUIT	DIRECT BURIAL
8	31.0'	(2)#6 + (1)#6 GND IN 3" SCH 80 PVC CONDUIT	DIRECT BURIAL
9	71.0'	(2)#6 + (1)#6 GND IN 3" SCH 80 PVC CONDUIT	DIRECT BURIAL
10	79.0'	(2)#6 + (1)#6 GND IN 4" SCH 80 PVC CONDUIT	DIRECT BURIAL
11	123.0'	(2)#6 + (1)#6 GND IN 4" SCH 80 PVC CONDUIT	DIRECT BURIAL
12	122.0'	(2)#6 + (1)#6 GND IN 3" SCH 80 PVC CONDUIT	DIRECT BURIAL
13	45.0'	(3)#6 + (1)#6 GND IN 3" SCH 80 PVC CONDUIT	DIRECT BURIAL

LIGHTING NOTES

1. PROJECT TO PROVIDE 120 /240 V POWER SERVICE FOR LIGHTING SYSTEM ON SOUTHEAST CORNER OF MARL PIT ROAD AND CEDAR LANE ROAD.
2. LIGHTING STANDARD STATIONS AND OFFSETS ARE TO CENTER OF POLE BASE.
3. PLACE LST #1 MAST ARM AT 6 DEGREE COUNTERCLOCKWISE ANGLE FROM THE PERPENDICULAR TO THE MARL PIT ROAD CONSTRUCTION BASE LINE (STATION 510+64, OFFSET 40.6' R).
4. PLACE LST #2 MAST ARM AT 58 DEGREE CLOCKWISE ANGLE FROM THE PERPENDICULAR TO THE CEDAR LANE ROAD CONSTRUCTION BASE LINE (STATION 426+22, OFFSET 50.3' L).
5. PLACE LST #4 MAST ARM AT 10 DEGREE COUNTERCLOCKWISE ANGLE FROM THE PERPENDICULAR TO THE MARL PIT ROAD CONSTRUCTION BASE LINE (STATION 514+57, OFFSET 46.2' R).
6. PLACE LST #5 MAST ARM AT 28 DEGREE COUNTERCLOCKWISE ANGLE FROM THE PERPENDICULAR TO THE MARL PIT ROAD CONSTRUCTION BASE LINE (STATION 513+33, OFFSET 51.4' R).
7. PLACE LST #6 MAST ARM AT 11 DEGREE COUNTERCLOCKWISE ANGLE FROM THE PERPENDICULAR TO THE CEDAR LANE ROAD CONSTUCTION BASE LINE (STATION 424+13, OFFSET 41.7' R).
8. PROJECT TO UTILIZE NAVION STREETWORKS 171W LED LUMINAIRE WITH TYPE 3 DISTRIBUTION AND 4000K COLOR TEMPERATURE AS SHOWN IN THE SCHEDULE.

PREPARED BY
DELDOT – TRANSPORTATION SOLUTIONS
TRAFFIC DESIGN

Nawatswei Tetteh — 02/12/2019
THIS SEAL APPLIES TO ALL SHEETS BEARING THE "TD" SECTION DESIGNATION. DATE

NAWATSWEI TETTEH LICENSE No. 14933 DELAWARE PROFESSIONAL ENGINEER
SEAL

ADDENDA / REVISIONS

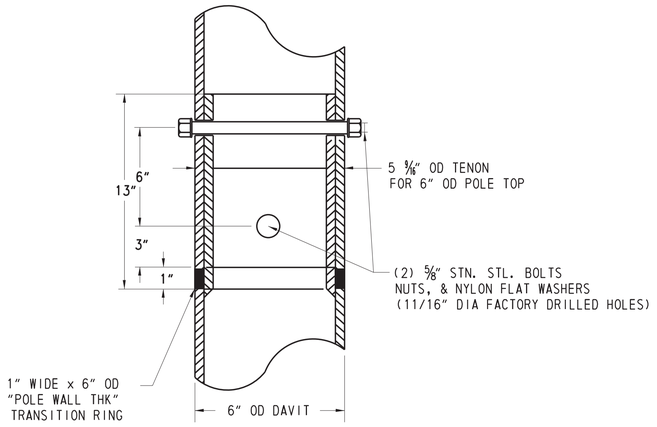
SCALE 0 30 60 90 FEET

CEDAR LANE ROAD AND MARL PIT ROAD INTERSECTION IMPROVEMENTS

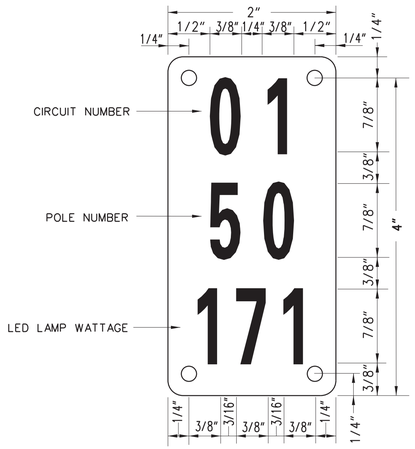
CONTRACT	BRIDGE NO.	N/A	SECTION
T201612001	DESIGNED BY:	NT	TD
COUNTY	CHECKED BY:	MS	SHEET NO.
NEW CASTLE			52

LIGHTING PLAN

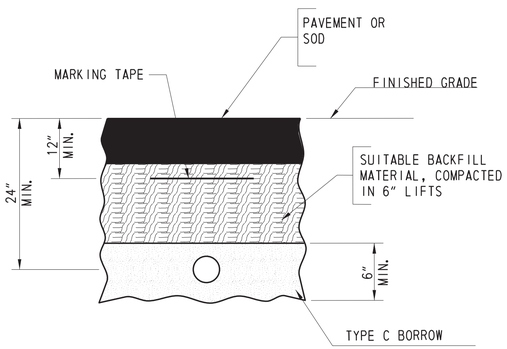
1-FEB-2019
12:58
Y:\NEWCASTL\427\Road\T201612001\Plans\LI.DGN



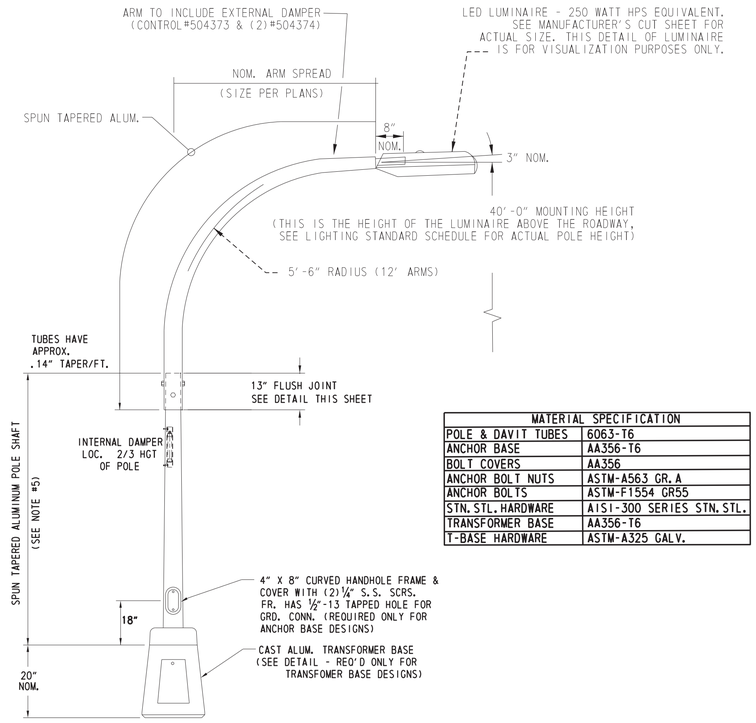
FLUSH JOINT DETAIL



TYPICAL POLE I.D. TAG



BURIED CONDUIT DETAIL

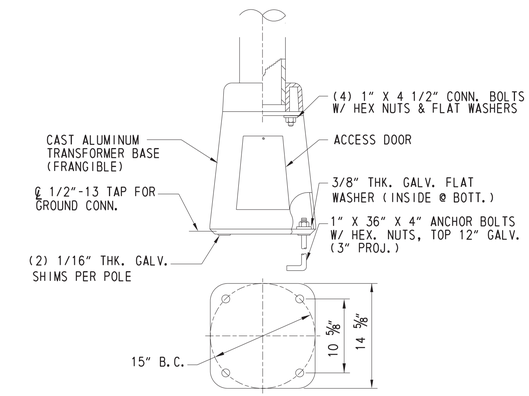


MATERIAL SPECIFICATION	
POLE & DAVIT TUBES	6063-T6
ANCHOR BASE	AA356-T6
BOLT COVERS	AA356
ANCHOR BOLT NUTS	ASTM-A563 GR. A
ANCHOR BOLTS	ASTM-F1554 GR55
STN. STL. HARDWARE	AISI-300 SERIES STN. STL.
TRANSFORMER BASE	AA356-T6
T-BASE HARDWARE	ASTM-A325 GALV.

DAVIT ARM LIGHT POLE DETAIL

N. T. S.

NOTES:
1. HEAT TREAT POLE & DAVIT TO -T6, TEMPER AFTER WELDING.
2. FINISH - POLE & DAVIT SHALL BE SATIN FINISHED POLISHED AND WRAPPED.
3. DESIGNED IN ACCORDANCE WITH STANDARDS ESTABLISHED BY THE LATEST EDITION OF AASHTO REQUIREMENTS.
4. TRANSFORMER SHALL MEET THE STANDARDS ESTABLISHED BY THE LATEST EDITION OF AASHTO BREAKAWAY REQUIREMENTS.
5. DUE TO VARYING ELEVATIONS OF ROADWAY, IT MAY BE NECESSARY TO MAINTAIN A NOMINAL FIXTURE MOUNTING HEIGHT (OF 30' OR 40', AS SPECIFIED ON PLANS) ABOVE THE ROADWAY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THESE MEASUREMENTS. BETWEEN TWO ADJACENT LUMINAIRES, THE DIFFERENCE IN HEIGHT SHALL NOT EXCEED 12".



TRANSFORMER BASE DETAIL

NOTES:
1. TRANSFORMER BASE SHALL BE PROVIDED WITH ALL LIGHT POLES, WHETHER PROTECTED OR UNPROTECTED, UNLESS OTHERWISE NOTED.
2. REFER TO NOTES FOR THE ANCHOR BASE DETAIL FOR CONDITIONS WHERE AN ANCHOR BASE IS REQUIRED.

GENERAL NOTES: (LIGHTING)

1. ALL ELECTRICAL WORK SHALL BE PERFORMED AND ALL MATERIAL PROVIDED SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE OF THE NATIONAL FIRE PROTECTION ASSOCIATION, TO ALL LOCAL AND SPECIAL LAWS, AND/OR TO ORDINANCES GOVERNING SUCH MATERIAL. CODE SHALL BE CONSIDERED THE MINIMUM REQUIREMENTS FOR THE ELECTRICAL WORK AND IF THERE IS A CONFLICT BETWEEN THE REQUIREMENTS SPECIFIED IN THE CONTRACT DOCUMENTS AND THE CODE, THE MORE STRINGENT REQUIREMENT WILL APPLY AS DETERMINED AND APPROVED BY THE ENGINEER. WHEN THESE REQUIREMENTS DO NOT GOVERN, AND WHERE NOT OTHERWISE SPECIFIED, ELECTRICAL MATERIALS SHALL CONFORM TO THE STANDARDIZATION RULES OF THE INSTITUTE OF ELECTRICAL ENGINEERS.
2. THE CONTRACTOR SHALL PROVIDE AND SECURE ALL ELECTRICAL INSPECTIONS AS REQUIRED AND PAY FOR THE SAME. THE ELECTRICAL CONTRACTOR SHALL OBTAIN AT HIS EXPENSE ALL NECESSARY PERMITS AND CERTIFICATES AS REQUIRED.
3. BURIED ELECTRICAL CABLE AND CONDUIT, AND OTHER UTILITIES MAY EXIST THROUGHOUT THIS PROJECT. ALL UNDERGROUND AND OVERHEAD UTILITIES SHOWN ON THESE PLANS ARE SCHEMATIC ONLY AND MAY NOT BE COMPLETE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING MISS UTILITY PRIOR TO THE BEGINNING OF CONSTRUCTION FOR UTILITY MARKOUTS. THE CONTRACTOR IS RESPONSIBLE FOR PREVENTING DAMAGE TO THEM, AND MAINTAINING THEM IN SERVICE WHEN AND WHERE REQUIRED. THE CONTRACTOR SHALL VERIFY THE EXACT LOCATIONS PRIOR TO COMMENCING WORK. IF THE CONTRACTOR PERCEIVES THAT A CONFLICT MAY OCCUR, THE CONTRACTOR SHALL NOTIFY DELDOT TRAFFIC IMMEDIATELY PRIOR TO COMMENCING CONSTRUCTION IN THAT AREA.
4. THE ELECTRICAL CONTRACTOR SHALL GUARANTEE ALL WORK MATERIAL AND LABOR TO BE FREE FROM DEFECTS FOR A ONE YEAR PERIOD FROM THE TIME OF OWNER ACCEPTANCE. ANY DEFECTS OCCURRING DURING THIS PERIOD SHALL BE CORRECTED BY THE ELECTRICAL CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
5. CONDUIT RUNS ARE SHOWN IN APPROXIMATE LOCATIONS. THE CONTRACTOR SHALL LOCATE THE CONDUIT RUNS IN A MANNER THAT AVOIDS CONFLICTS WITH ALL EXISTING AND PROPOSED FEATURES AS FIELD CONDITIONS DICTATE AND AS APPROVED BY THE ENGINEER.
6. ALL GALVANIZED CONDUITS(GRC) SHALL BE REAMED AND THREADED. ALL GRC SHALL BE THREADED TOGETHER WITH APPROVED COUPLINGS. SET, SCREW, BOLTED AND COMPESSION FITTINGS ARE NOT ACCEPTABLE.
7. TERMINATE ALL GALVANIZED CONDUITS WHEN ENTERING ENCLOSURES WITH LOCKNUT AND BONDING BUSHINGS. ALL OTHER GALVANIZED CONDUITS SHALL BE PROVIDED WITH BONDING BUSHINGS. ALL GALVANIZED CONDUITS SHALL BE BONDED WITH GROUND WIRE.
8. COLOR CODING SHALL BE PROVIDED THROUGHOUT THE ENTIRE NETWORK FOR SERVICE,FEEDER, BRANCH AND CONTROL CONDUCTORS. EACH PHASE SHALL BE AN INDEPENDENT COLOR. CONDUCTORS SHALL HAVE FACTORY IMPREGNATED COLOR THROUGHOUT THEIR ENTIRE LENGTH. PHASE TAPING IS NOT PERMITTED.
9. THE CONTRACTOR SHALL NOTIFY TOWN OF MIDDLETOWN TWO WEEKS IN ADVANCE TO ARRANGE FINAL POWER CONNECTIONS.
10. ALL FUSED CONNECTIONS SHALL BE MADE IN THE POLE BASE. SPLICES IN JUNCTION WELLS SHALL NOT BE FUSED.
11. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AT SITE PRIOR TO WORK. WORK INCLUDES FURNISHING LABOR, MATERIAL, EQUIPMENT AND SERVICE NECESSARY AND INCIDENTAL TO PROPER COMPLETION OF THE ELECTRICAL WORK AS SHOWN. MINOR ITEMS,ACCESSORIES OR DEVICES NECESSARY FOR COMPLETION AND PROPER OPERATION OF ANY SYSTEM SHALL BE PROVIDED WHETHER OR NOT THEY ARE SPECIFICALLY CALLED FOR BY SPECIFICATIONS OR DRAWINGS.
12. ALL CONDUITS, JUNCTION WELLS, LIGHTING STANDARDS, ETC. SHALL BE STAKED OUT AND EVERY LOCATION APPROVED BY THE ENGINEER BEFORE ANY WORK IS DONE.
13. ALL STATION AND OFFSET INFORMATION SHOWN ON THE PLANS FOR PROPOSED LIGHTING STANDARDS IS TO THE CENTER OF THE POLE BASE.
14. SPLICES FOR ALL ROADWAY LIGHTING ELECTRICAL CABLES SHALL BE COMPLETED USING APPROVED SPLICE KITS OR METHODS APPROVED BY THE ENGINEER AND SHALL BE INCIDENTAL TO THE SUPPLY AND INSTALLATION OF VARIOUS ROADWAY LIGHTING ELECTRICAL CABLES.
15. ALL PROPOSED DAVIT ARM LIGHTING STANDARDS SHALL BE PROVIDED AND INSTALLED WITH BREAKAWAY TRANSFORMER BASES.
16. ALL LIGHT POLE FOUNDATIONS SHALL BE DELDOT STANDARD POLE BASE TYPE 6 (STD. NO. T-5).
17. UNDERGROUND CONDUIT SHALL BE SLOPED TO DRAIN TO NEAREST JUNCTION WELL. IF THIS CANNOT BE ACCOMPLISHED, PROVIDE A DRAINAGE TEE AT LOW POINT OF CONDUIT RUN. DRAINAGE TEES SHALL BE INCIDENTAL TO SUPPLY OF CONDUIT.
18. RIGID GALVANIZED STEEL CONDUIT SHALL BE USED FOR ELECTRICAL SERVICE. SCHEDULE 80 PVC CONDUIT SHALL BE USED IN TRENCHES. SCHEDULE 80 HDPE CONDUIT SHALL BE USED FOR BORES.
19. CONTRACTOR SHALL VERIFY THE LUMINAIRE DETAIL WITH THE LED SUPPLIER.

PREPARED BY
DELDOT – TRANSPORTATION SOLUTIONS
TRAFFIC DESIGN

Naa-Atswei Tetteh — 02/12/2019
THIS SEAL APPLIES TO ALL SHEETS BEARING THE "TD" SECTION DESIGNATION. — DATE

MAATSWEI TETTEH LICENSE No. 14933 DELAWARE PROFESSIONAL ENGINEER
SEAL

ADDENDA / REVISIONS		NOT TO SCALE	CEDAR LANE ROAD AND MARL PIT ROAD INTERSECTION IMPROVEMENTS	CONTRACT T201612201	BRIDGE NO. N/A	LIGHTING DETAILS	SECTION TD
				COUNTY NEW CASTLE	DESIGNED BY: NT		SHEET NO. 53
					CHECKED BY: MS		

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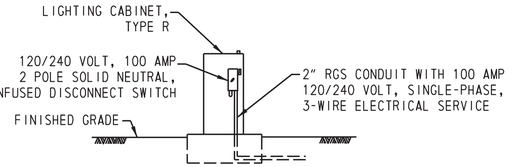
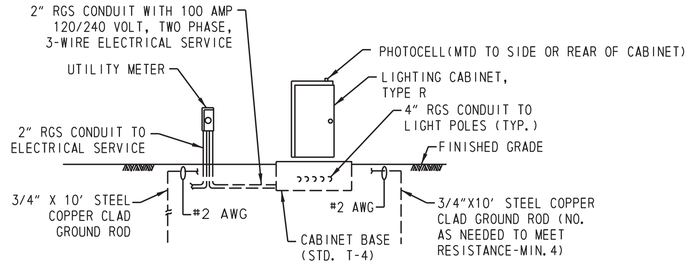
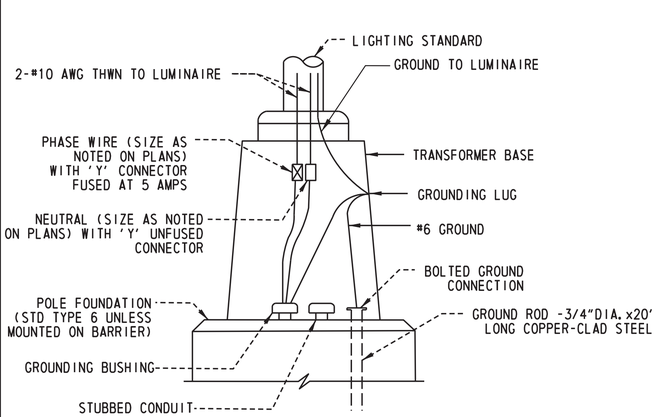


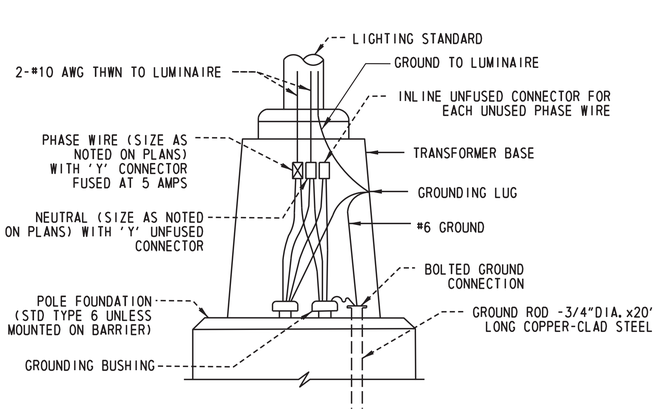
LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE (SIDE VIEW)



ELECTRICAL SERVICE ON PEDESTAL AND LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE (FRONT VIEW)

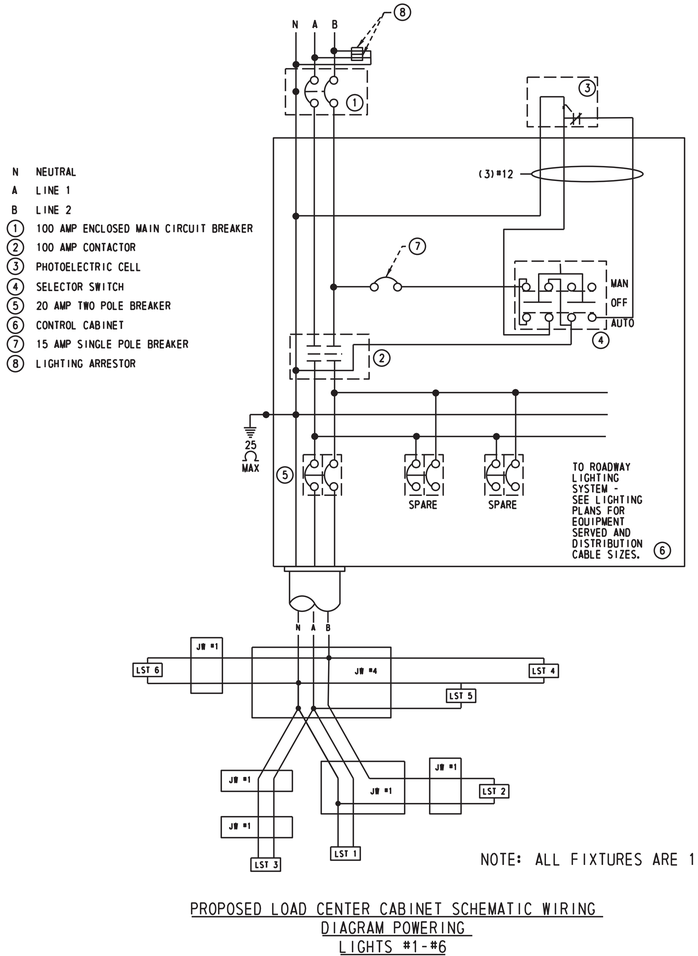


TYPICAL LUMINAIRE CONNECTION
120/240V SERVICE
END OF RUN



TYPICAL LUMINAIRE CONNECTION
120/240V SERVICE
CONTINUOUS RUN

WIRING SCHEMATICS IN TRANSFORMER BASE



NOTE: ALL FIXTURES ARE 171W LED LUMINAIRES

PROPOSED LOAD CENTER CABINET SCHEMATIC WIRING
DIAGRAM POWERING
LIGHTS #1-#6
N.T.S.

LIGHTING PANEL SCHEDULE

TYPE: 1P, 3W
NUMBER OF POLES: 6(MIN)
GROUND BUS RATING: 100%
MAIN BUS RATING: 100 AMP
MAIN RATING: 100 AMP, 1P MCB
VOLTAGE 120/240
ENCLOSURE: TYPE R, NEMA 3R
PANEL MIN. A.I.C. RATING: 10KA
LOCATION: MARL PIT RD, SOUTH OF ROUNDABOUT

CIRCUIT NO.	CIRCUIT BKR	DESCRIPTION	LOAD/PHASE LOAD	L1	L2	LOAD	DESCRIPTION	CIRCUIT BKR	CIRCUIT NO.
1		LST 1, 3, 5	513	513	513	513	LST 2, 4, 6		2
3	20A	N/A	-	-	-	-	N/A		4
5		N/A	-	-	-	-	N/A	20A	6
7		N/A	-	-	-	-	N/A		8
TOTALS			513	513					
TOTAL CONNECTED VA LOAD			1026						

PREPARED BY
DELDOT – TRANSPORTATION SOLUTIONS
TRAFFIC DESIGN

02/12/2019
DATE

THIS SEAL APPLIES TO ALL SHEETS BEARING THE "TD" SECTION DESIGNATION.

MAA-ATSWEI TETTEH LICENSE No. 14933 DELAWARE PROFESSIONAL ENGINEER
SEAL

ADDENDA / REVISIONS		NOT TO SCALE	CEDAR LANE ROAD AND MARL PIT ROAD INTERSECTION IMPROVEMENTS	CONTRACT T201612001	BRIDGE NO. N/A	LIGHTING DETAILS	SECTION TD
				COUNTY NEW CASTLE	DESIGNED BY: NT		SHEET NO. 54
					CHECKED BY: MS		

$DATE$
$TIME$
$FILENAME$
T:\TRAFFIC\USERS\MAA-ATSWEI\TRAFFIC SYSTEMS DESIGN\SIGNAL DESIGN\CEDAR LANE & MARL PIT RD LATEST\52016\FINAL DESIGN\LIGHTING DETAILS2.CEDAR LANE & MARL PIT RD.- FINAL.DGN

PANELBOARD SE

AIC RATING - 22 KAIC
SOLID NEUTRAL
ENCLOSURE: BASE MOUNTED CABINET

100 AMP BUS
240 VOLTS
SURFACE MOUNTED

100 AMP MCCB
1PHASE, 3 WIRE + GROUND

LOAD SERVED	CIRCUIT BREAKER			CKT. NO.	CKT. NO.	CIRCUIT BREAKER			LOAD SERVED
	FRAME	TRIP	POLE			FRAME	TRIP	POLE	
EXISTING	100	40	1	1	2	100	40	1	EXISTING
EXISTING	100	40	1	3	4	100	40	1	EXISTING
EXISTING	100	40	1	5	6	100	40	1	EXISTING
8-215W LED	100	40	1	7	8	100	40	1	7-215W LED
SPARE	100	20	1	9	10	100	20	1	SPARE

LIGHTING SERVICE SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE	DESCRIPTION	INSTALLATION
1*	4	4.0"	6'	EX.(9)#6, EX. (4)#6 GROUND, [NEW (4)#2]	-
2*	1	4.0"	94'	EX.(9)#6, EX. (1)#6 GROUND, [NEW (4)#2]	-
3	1	4.0"	74'	[NEW (4)#2, (1)#6 GROUND]	BORE
4	1	4.0"	241'	[NEW (4)#2, (1)#6 GROUND]	TRENCH
5	1	4.0"	178'	[NEW (4)#2, (1)#6 GROUND]	TRENCH
6	1	3.0"	6'	[NEW (2)#6, (1)#6 GROUND]	TRENCH
7	1	4.0"	180'	[NEW (4)#2, (1)#6 GROUND]	TRENCH
8	1	3.0"	6'	[NEW (2)#6, (1)#6 GROUND]	TRENCH
9	1	4.0"	182'**	[NEW (4)#2, (1)#6 GROUND]	TRENCH

NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.
* DENOTES EXISTING CONDUIT
** SERVICE RUN CONTINUES ON ADJACENT SHEET

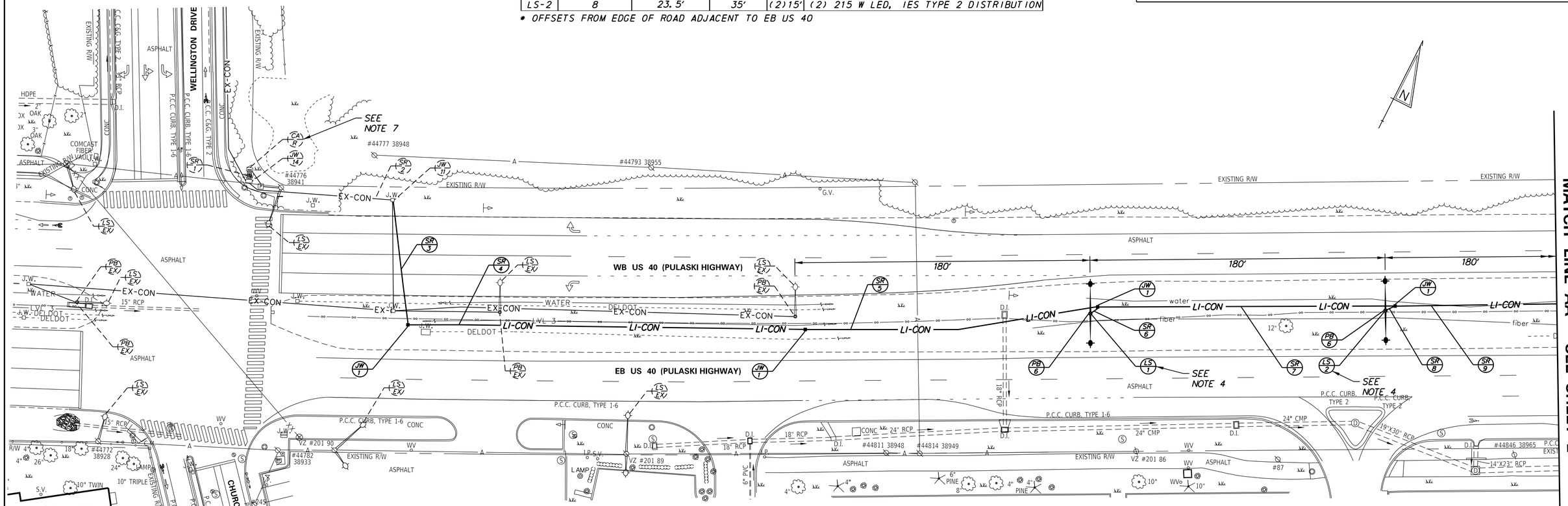
LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	OFFSET FROM EDGE OF ROAD	HEIGHT	ARM	LIGHT STANDARD
LS-1	7	23'	35'	(2)15'	(2) 215 W LED, IES TYPE 2 DISTRIBUTION
LS-2	8	23.5'	35'	(2)15'	(2) 215 W LED, IES TYPE 2 DISTRIBUTION

* OFFSETS FROM EDGE OF ROAD ADJACENT TO EB US 40

LIGHTING SYMBOL LEGEND

SYMBOL	DESCRIPTION
	- EXISTING & PROPOSED LIGHTING STANDARD AND POLE BASE
EX	- EXISTING LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE AND IDENTIFIER
J.W.	- EXISTING & PROPOSED LIGHTING JUNCTION WELL
LS EX / LS	- EXISTING & PROPOSED LIGHTING STANDARD IDENTIFIERS
—EX-CON— / —LI-CON—	- EXISTING & PROPOSED LIGHTING SERVICE RUN
SR	- EXISTING & PROPOSED SERVICE RUN IDENTIFIER
JW	- EXISTING & PROPOSED LIGHTING JUNCTION WELL IDENTIFIER (TYPE)
PB	- EXISTING & PROPOSED LIGHTING POLE BASE IDENTIFIER (TYPE)
	- EXISTING UTILITY POLE
	- EXISTING ELECTRICAL SERVICE PEDESTAL



NOTES:

1. PHOTOELECTRIC CONTROL FOR ALL PROPOSED LUMINAIRES SHALL BE AT THE EXISTING LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE.
2. THE CONTRACTOR SHALL STAKEOUT ALL PROPOSED LIGHT POLE LOCATIONS PRIOR TO INSTALLATION OF THE POLE BASE. IF THE CONTRACTOR PERCEIVES THAT AN UNDERGROUND OR OVERHEAD UTILITY CONFLICT EXISTS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER FOR A RESOLUTION.
3. DELDOT LIGHTING STANDARDS SHALL BE INSTALLED ON BREAKAWAY TRANSFORMER BASES.
4. THE PROPOSED DELDOT LIGHTING STANDARD LUMINAIRE SHALL BE 215 WATT LED, IES TYPE 2 HORIZONTAL DISTRIBUTION, COBRA-HEAD STYLE FIXTURE WITH CUT-OFF OPTICS MOUNTED WITH 0 DEGREE TILT ANGLE (CATALOG NO. ATB2 60BLEDE10 MVOLT R2 NR).
5. ALL CONDUIT SHALL BE SCHEDULE 80 PVC WHEN INSTALLED BY TRENCHING OR OPEN CUTTING AND HDPE SDR-13.5 WHEN INSTALLED BY BORING, UNLESS OTHERWISE NOTED.
6. EXISTING JUNCTION WELLS AND CONDUITS WITHOUT IDENTIFIERS ARE NOT TO BE USED FOR THE INSTALLATION OF PROPOSED LIGHTING CABLES.
7. THE CONTRACTOR SHALL UTILIZE THE EXISTING LIGHTING CABINET TO INSTALL THE PROPOSED LUMINAIRES.
8. THE CONTRACTOR SHALL USE COLOR CODED WIRING BY CIRCUIT.
9. ALL WORK PERFORMED UNDER THIS PROJECT IS INTENDED TO OCCUR WITHIN DELDOT'S EXISTING RIGHT-OF-WAY BASED ON THE RIGHT-OF-WAY PLANS FOR CONTRACT NO. T201611902.

PREPARED BY

Whitman, Requardt and Associates, LLP
Engineers Architects Environmental Planners Est. 1915

4/7/2020
DATE

THIS SEAL APPLIES TO ALL SHEETS BEARING THE "WRA" SECTION DESIGNATION.

MATTHEW J.A. BUCKLEY — No. 16224 — DELAWARE
SEAL

CONCURRENCE FOR INSTALLATION

CHIEF TRAFFIC ENGINEER — DATE

DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE
0 30 60 90
FEET

CONTRACT	PERMIT NO.	N552
T202004001	DESIGNED BY: DWC	
COUNTY	CHECKED BY: MJB	
NEW CASTLE		

LIGHTING PLAN
US 40 (PULASKI HIGHWAY)
CHURCH RD / WELLINGTON RD
TO ROCKWOOD RD

SECTION
WRA
SHEET NO.
1

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LIGHTING SERVICE SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE	DESCRIPTION	INSTALLATION
9	1	4.0"	182' **	[NEW (4)#2, (1)#6 GROUND]	TRENCH
10	1	3.0"	10'	[NEW (2)#6, (1)#6 GROUND]	TRENCH
11	1	4.0"	173'	[NEW (4)#2, (1)#6 GROUND]	TRENCH
12	1	3.0"	5'	[NEW (2)#6, (1)#6 GROUND]	TRENCH
13	1	4.0"	181'	[NEW (4)#2, (1)#6 GROUND]	TRENCH
14	1	3.0"	8'	[NEW (2)#6, (1)#6 GROUND]	TRENCH
15	1	4.0"	181'	[NEW (4)#2, (1)#6 GROUND]	TRENCH
16	1	3.0"	11'	[NEW (2)#6, (1)#6 GROUND]	TRENCH
17	1	4.0"	175'	[NEW (4)#2, (1)#6 GROUND]	TRENCH
18	1	3.0"	7'	[NEW (2)#6, (1)#6 GROUND]	TRENCH
19	1	3.0"	117'	[NEW (2)#6, (1)#6 GROUND]	TRENCH

NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.
* DENOTES EXISTING CONDUIT
** SERVICE RUN CONTINUES ON ADJACENT SHEET

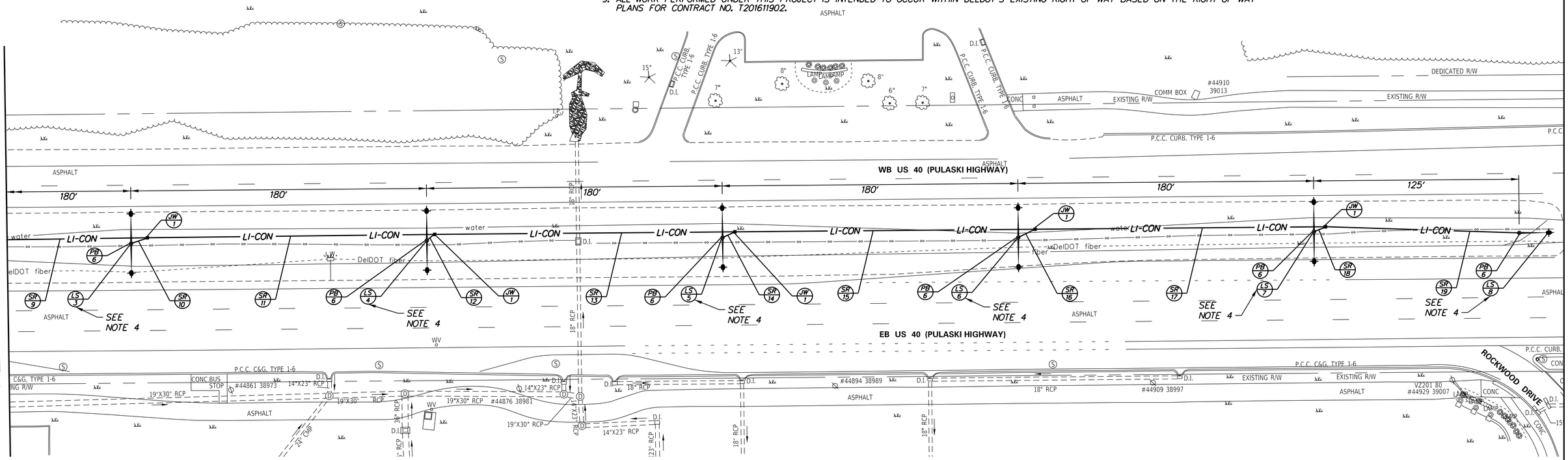
LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	OFFSET FROM EDGE OF ROAD	HEIGHT	ARM	LIGHT STANDARD
LS-3	7	23'	35'	(2)15'	(2) 215 W LED, IES TYPE 2 DISTRIBUTION
LS-4	8	23.5'	35'	(2)15'	(2) 215 W LED, IES TYPE 2 DISTRIBUTION
LS-5	7	23'	35'	(2)15'	(2) 215 W LED, IES TYPE 2 DISTRIBUTION
LS-6	8	23.5'	35'	(2)15'	(2) 215 W LED, IES TYPE 2 DISTRIBUTION
LS-7	7	23'	35'	(2)15'	(2) 215 W LED, IES TYPE 2 DISTRIBUTION
LS-8	8	23.5'	35'	15'	215 W LED, IES TYPE 2 DISTRIBUTION

* OFFSETS FROM EDGE OF ROAD ADJACENT TO EB US 40

NOTES:

1. PHOTOELECTRIC CONTROL FOR ALL PROPOSED LUMINAIRES SHALL BE AT THE EXISTING LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE.
2. THE CONTRACTOR SHALL STAKEOUT ALL PROPOSED LIGHT POLE LOCATIONS PRIOR TO INSTALLATION OF THE POLE BASE. IF THE CONTRACTOR PERCEIVES THAT AN UNDERGROUND OR OVERHEAD UTILITY CONFLICT EXISTS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER FOR A RESOLUTION.
3. DELDOT LIGHTING STANDARDS SHALL BE INSTALLED ON BREAKAWAY TRANSFORMER BASES.
4. THE PROPOSED DELDOT LIGHTING STANDARD LUMINAIRE SHALL BE 215 WATT LED, IES TYPE 2 HORIZONTAL DISTRIBUTION, COBRA-HEAD STYLE FIXTURE WITH CUT-OFF OPTICS MOUNTED WITH 0 DEGREE TILT ANGLE (CATALOG NO. ATB2 60BLEDE10 MVOLT R2 NR).
5. ALL CONDUIT SHALL BE SCHEDULE 80 PVC WHEN INSTALLED BY TRENCHING OR OPEN CUTTING AND HDPE SDR-13.5 WHEN INSTALLED BY BORING, UNLESS OTHERWISE NOTED.
6. EXISTING JUNCTION WELLS AND CONDUITS WITHOUT IDENTIFIERS ARE NOT TO BE USED FOR THE INSTALLATION OF PROPOSED LIGHTING CABLES.
7. THE CONTRACTOR SHALL UTILIZE THE EXISTING LIGHTING CABINET TO INSTALL THE PROPOSED LUMINAIRES.
8. THE CONTRACTOR SHALL USE COLOR CODED WIRING BY CIRCUIT.
9. ALL WORK PERFORMED UNDER THIS PROJECT IS INTENDED TO OCCUR WITHIN DELDOT'S EXISTING RIGHT-OF-WAY BASED ON THE RIGHT-OF-WAY PLANS FOR CONTRACT NO. T201611902.



PREPARED BY

Whitman, Requardt and Associates, LLP
Engineers Architects Environmental Planners Est. 1915

4/7/2020
DATE

THIS SEAL APPLIES TO ALL SHEETS BEARING THE "WRA" SECTION DESIGNATION.

SEAL

CONCURRENCE FOR INSTALLATION

CHIEF TRAFFIC ENGINEER — DATE

DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE
0 30 60 90
FEET

CONTRACT	PERMIT NO.	N552
T202004001	DESIGNED BY: DWC	
COUNTY	CHECKED BY: MJB	
NEW CASTLE		

LIGHTING PLAN
US 40 (PULASKI HIGHWAY)
CHURCH RD / WELLINGTON RD
TO ROCKWOOD RD

SECTION: WRA
SHEET NO.: 2

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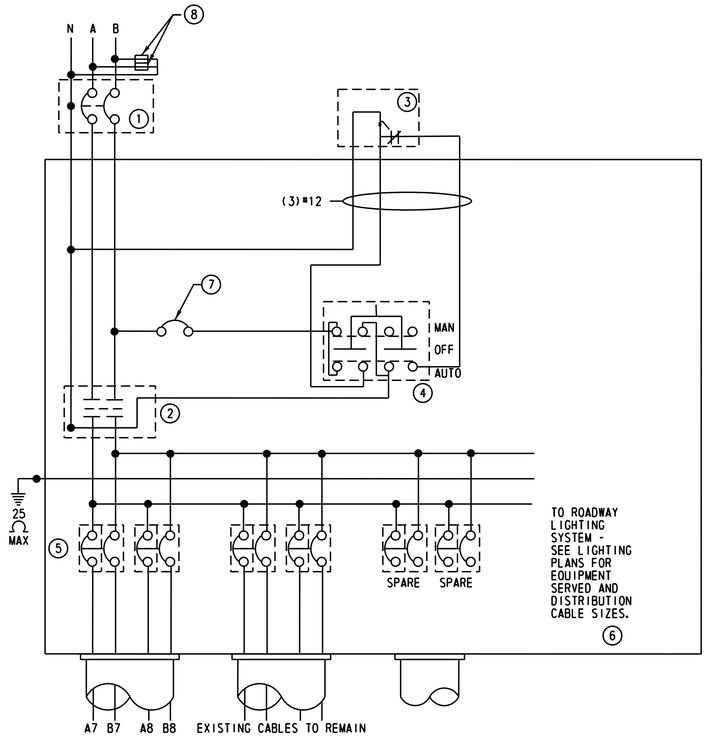
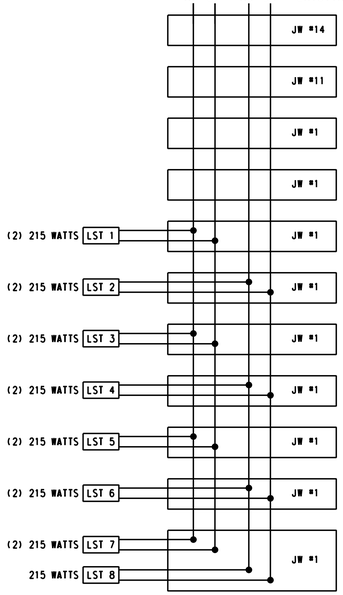


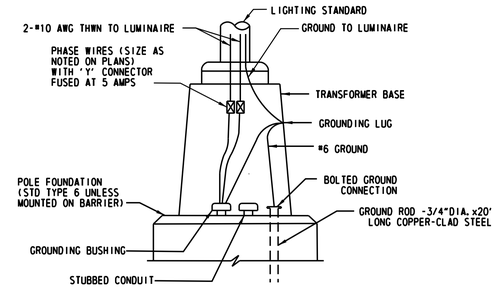


1A LINE 1
1B LINE 2
1. 100 AMP ENCLOSED MAIN CIRCUIT BREAKER
2. 100 AMP CONTACTOR
3. PHOTOELECTRIC CELL
4. SELECTOR SWITCH
5. 20 AMP 2P BREAKER
6. CONTROL CABINET
7. 15 AMP SINGLE POLE BREAKER
8. LIGHTING ARRESTOR

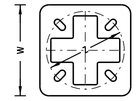
NOTES:

1. ALL WIRING #2 OR LARGER SHALL BE INSTALLED IN FLEXIBLE CONDUIT FOR SERVICE FEEDS.
2. NO CONDUCTORS MAY ENTER OR EXIT THROUGH THE REAR OF ANY PANEL.
3. THE LIGHTING CONTACTOR SHALL BE IN A PROPERLY SIZED ENCLOSURE.
4. ALL CONDUCTORS NOT IN CONDUIT SHALL BE BUNDLED OR WRAPPED AND SECURED IN CABINET AWAY FROM SHARP EDGES.
5. BONDING BUSHINGS SHALL BE USED FOR ALL CONCENTRIC KNOCKOUTS.
6. ALL CABLES SHALL MEET AMPACITY REQUIREMENTS OF THE NATIONAL ELECTRIC CODE. THE MINIMUM CABLE SIZE WITHIN THE CONTROL CENTER SHALL BE NO. 12 AWG.
7. REFER TO PLANS FOR NUMBER AND SIZE OF CIRCUIT BREAKERS.
8. REFER TO PLANS FOR NUMBER AND SIZE OF ELECTRODE GROUNDING CONDUCTOR WIRES REQUIRED.
9. ULTIMATE CABINET WIRING AND CONFIGURATION TO BE DETERMINED BY CANAL DISTRICT MAINTENANCE.

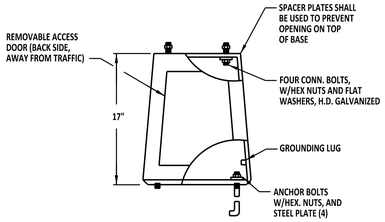
PROPOSED CIRCUIT DIAGRAM

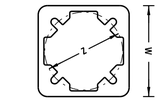


TYPICAL LUMINAIRE CONNECTION - 240V SERVICE END OF RUN



TOP VIEW





BOTTOM VIEW

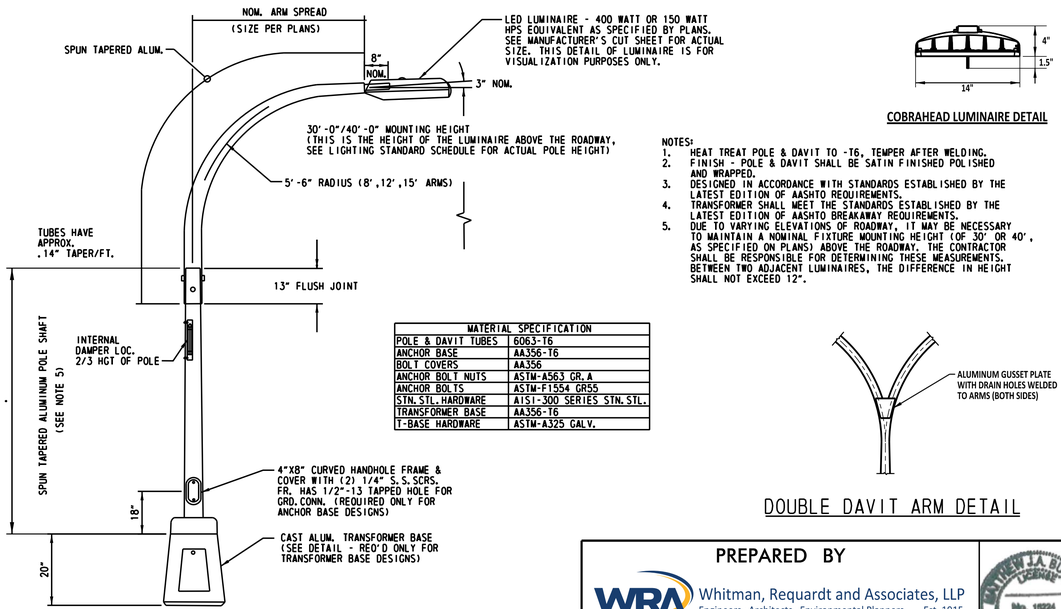
MOUNTING HEIGHT	ARM LENGTH	MIN WIDTH 'W'	BOLT DIA.	BOLT CIRCLE 'Z'
LESS THAN 40'	LESS THAN 30'	13"	1"	13 ½"
	30'	15"	1 ¼"	15"
40'	LESS THAN OR EQUAL TO 20'	13"	1"	13 ½"

CONSTRUCTION NOTES

1. ALUMINUM TRANSFORMER BASE SHALL MEET 1985 AASHTO BREAKAWAY REQUIREMENTS.
2. BREAKAWAY TRANSFORMER BASES SHALL BE INSTALLED WITH ALL POLES, UNLESS OTHERWISE NOTED.
3. LIGHT STANDARDS MOUNTED TO BRIDGE/RETAINING/BARRIER WALLS DO NOT REQUIRE BREAKAWAY BASES.
4. OPENING OF TRANSFORMER BASE ACCESS DOOR SHALL BE INSTALLED ON THE SIDE OF THE POLE FACING AWAY FROM TRAFFIC.
5. PROVIDE ACCESSIBLE GROUNDING NUT OR LUG INSIDE TRANSFORMER BASE.
6. PROVIDE WASHERS, SHIMS AND BOLTS AS REQUIRED BY TRANSFORMER BASE MANUFACTURER.
7. THE CONTACT AREA BETWEEN THE TRANSFORMER BASE AND CONCRETE FOUNDATION SHALL BE SHOP COATED WITH COAL TAR EPOXY MEETING SSPC-PAINT 16 SPECIFICATIONS. THE THICKNESS OF THE COATING SHALL BE BETWEEN 6 AND 8 MILS. THE COATING SHALL BE COMPLETELY DRY BEFORE INSTALLATION. THE TOP OF THE FOUNDATION SHALL NOT BE PAINTED.
8. TOP AND BOTTOM OF BASE MAY BE SLOTTED FOR BOLT CIRCLE. SLOT MUST ACCOMMODATE DIMENSION SHOWN.
9. TRANSFORMER BASE AND ASSOCIATED COMPONENTS SHALL MEET THE FOLLOWING MATERIAL REQUIREMENTS:

   ANCHOR BASE - AA356-T6
   BOLT COVERS - AA356
   ANCHOR BOLT NUTS ASTM - A563 GR.A
   ANCHOR BOLTS - ASTM - F1554 GR55
   STN. STL HARDWARE - AISI - 300 SERIES SST
   TRANSFORMER BASE - AA356 - T6
   T-BASE HARDWARE - ASTM - A325 GALV.

LIGHTING STRUCTURE ON BREAKAWAY TRANSFORMER BASE

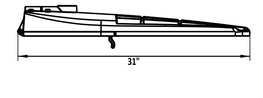


DAVIT ARM LIGHT POLE DETAIL

N. T. S.

NOTES:
1. HEAT TREAT POLE & DAVIT TO -T6, TEMPER AFTER WELDING.
2. FINISH - POLE & DAVIT SHALL BE SATIN FINISHED POLISHED AND WRAPPED.
3. DESIGNED IN ACCORDANCE WITH STANDARDS ESTABLISHED BY THE LATEST EDITION OF AASHTO REQUIREMENTS.
4. TRANSFORMER SHALL MEET THE STANDARDS ESTABLISHED BY THE LATEST EDITION OF AASHTO BREAKAWAY REQUIREMENTS.
5. DUE TO VARYING ELEVATIONS OF ROADWAY, IT MAY BE NECESSARY TO MAINTAIN A NOMINAL FIXTURE MOUNTING HEIGHT (OF 30' OR 40', AS SPECIFIED ON PLANS) ABOVE THE ROADWAY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THESE MEASUREMENTS. BETWEEN TWO ADJACENT LUMINAIRES, THE DIFFERENCE IN HEIGHT SHALL NOT EXCEED 12".

MATERIAL SPECIFICATION	
POLE & DAVIT TUBES	6063-T6
ANCHOR BASE	AA356-T6
BOLT COVERS	AA356
ANCHOR BOLT NUTS	ASTM-A563 GR.A
ANCHOR BOLTS	ASTM-F1554 GR55
STN. STL. HARDWARE	AISI-300 SERIES STN.STL.
TRANSFORMER BASE	AA356-T6
T-BASE HARDWARE	ASTM-A325 GALV.



COBRAHEAD LUMINAIRE DETAIL

DOUBLE DAVIT ARM DETAIL

PREPARED BY

Whitman, Requardt and Associates, LLP
Engineers • Architects • Environmental Planners Est. 1915

4/7/2020
DATE

THIS SEAL APPLIES TO ALL SHEETS BEARING THE "WRA" SECTION DESIGNATION.

MATTHEW J.A. BUCKLEY No. 16224 PROFESSIONAL ENGINEER
SEAL

CONCURRENCE FOR INSTALLATION

CHIEF TRAFFIC ENGINEER — DATE

DELAWARE DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS	

NOT TO SCALE

CONTRACT	PERMIT NO.	N552
T202004001	DESIGNED BY: DWC	
COUNTY	CHECKED BY: MJB	
NEW CASTLE		

LIGHTING DETAILS US 40 (PULASKI HIGHWAY) CHURCH RD /WELLINGTON RD TO ROCKWOOD RD

SECTION
WRA
SHEET NO.
3

N:\13128-001\CADD\LV03_US 40_@ Church_Detdot.dgn
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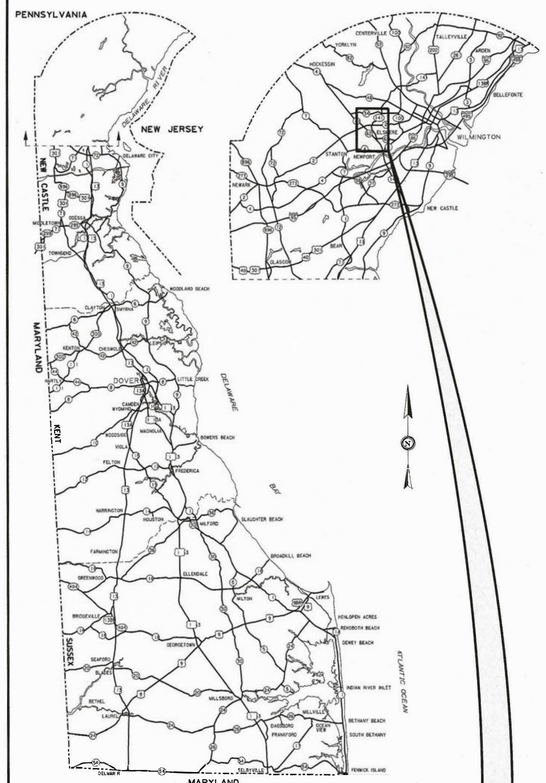
APPENDIX H.
SAMPLE PLAN – LARGER INTERSECTION LIGHTING DESIGN



GENERAL LOCATION OF CONTRACT

THE STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION

U.S. CUSTOMARY UNITS

CONSTRUCTION PLANS FOR:

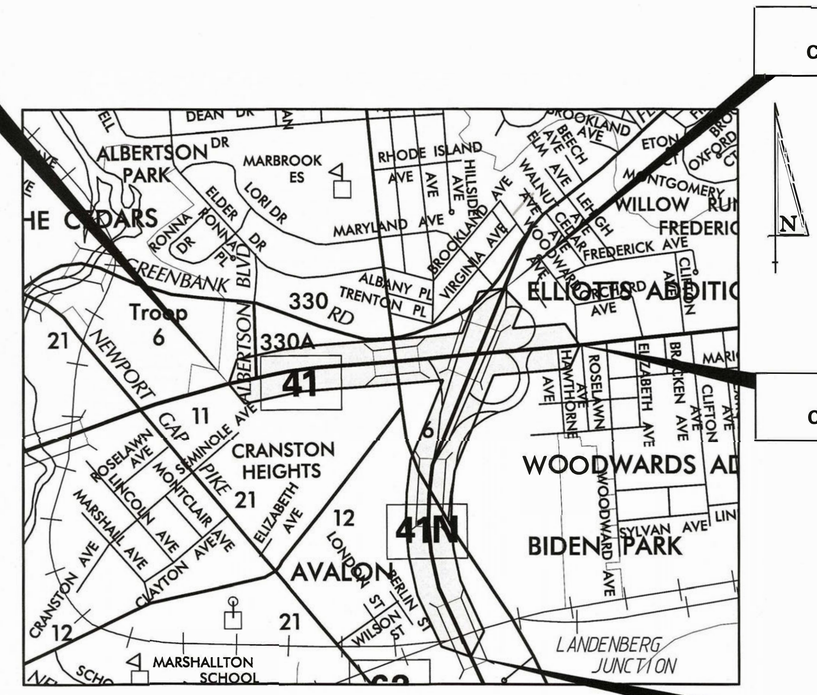
PRICES CORNER INTERCHANGE
LIGHTING DESIGN

CONTRACT NUMBER: T201880206
FEDERAL AID PROJECT NUMBER: ESTP-2019(16)

COUNTY: NEW CASTLE M.R. #: N006

LIMITS OF CONSTRUCTION

LIMITS OF CONSTRUCTION



LIMITS OF CONSTRUCTION

LIMITS OF CONSTRUCTION

INDEX OF SHEETS

SHEET Nº	TABLE OF CONTENTS
1	TITLE SHEET
2	PLAN SHEET INDEX
3	LEGEND
4	PROJECT NOTES
5-16	LIGHTING PLANS
17-19	LIGHTING DETAILS

TOTAL SHEETS: 19

APPROVED DESIGN EXCEPTIONS

DESIGN PARAMETER	REQUIRED	PROVIDED	DATE

ADDENDA & REVISIONS

DESCRIPTION	NAME & DATE

PREPARED BY
THE CONSULTING FIRM OF

JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future®
121 Continental Drive, Suite 300 Newark, DE 19713

MIR A. WAHED
LICENSE
No. 14810
DELAWARE
PROFESSIONAL ENGINEER
SEAL

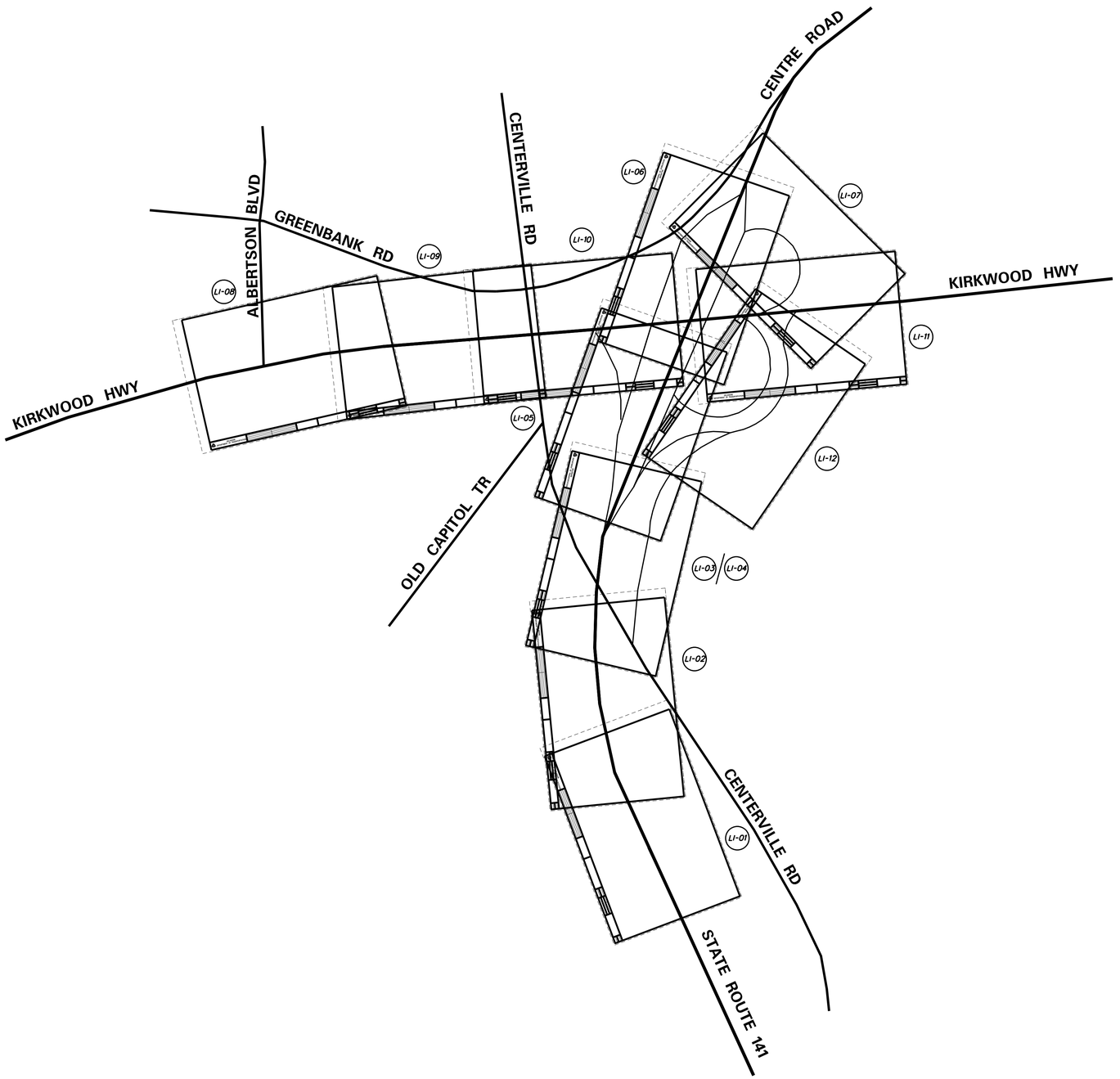
Mir Wahed — 1/29/2020
RECOMMENDED — DATE

APPROVED FOR ADVERTISEMENT

DATE

APPROVED FOR ADVERTISEMENT

1/30/2020
DATE



ADDENDA / REVISIONS		SCALE 0 300 600 900 FEET	PRICES CORNER INTERCHANGE LIGHTING DESIGN	CONTRACT T201880206	BRIDGE NO. X	PLAN SHEET INDEX	SECTION JMT
				COUNTY NEW CASTLE	DESIGNED BY: KAB		SHEET NO. 2
					CHECKED BY: MAW		

PLOTTED BY: KREHM DATE: 1/27/2020
FILE LOCATION: Q:\NDE\150151_000_TRAFFIC_ENGINEERING_\CADD\4.2_PRICES CORNER\S.DGN [SHEET:]

EXISTING SYMBOLS

DRAINAGE	
	DITCH OR STREAM CENTERLINE
	DIRECTIONAL STREAM FLOW ARROW
C.B. / D.I.	DRAINAGE INLET
J.B.	DRAINAGE JUNCTION BOX
Ⓓ	DRAINAGE MANHOLE
SIZE/TYPE LABEL	DRAINAGE PIPE AND FLOW ARROW
	DRAINAGE PIPE HEADWALL
	RIPRAP - AREA FEATURE
	RIPRAP - LINEAR FEATURE

MANMADE ROADSIDE FEATURES	
	BOLLARD - STEEL POLE
	BOLLARD - WOOD POST
(TYPE LABEL)	CURB
(TYPE LABEL)	CURB AND GUTTER
	FENCE - CHAINLINK OR STRANDED
	FENCE - STOCKADE OR SPLIT RAIL
FP	FLAG POLE
	GUARDRAIL - STEEL BEAM
	GUARDRAIL - WIRE ROPE
LAMP	LAMP AND POST - RESIDENTIAL
MB	MAILBOX
PM	PARKING METER AND POST
	PAVEMENT - FLEXIBLE
	PAVEMENT - RIGID
	PILE - BRIDGE
	PILLAR OR MISCELLANEOUS POST
	TRAFFIC SIGN AND POST
	WALL - BRICK OR BLOCK
	WALL - STONE

NATURAL ROADSIDE FEATURES	
	GRASS LAWN
	HEDGEROW OR THICKET
	MARSH BOUNDARY LINE
	TREE - CONIFEROUS
	TREE - DECIDUOUS
	TREE STUMP
	SHRUBBERY
WL	DELINEATED WETLAND BOUNDARY LINE
	WOODS LINE BOUNDARY

RIGHT-OF-WAY SYMBOLS	
C.M.	PROPERTY MARKER - CONCRETE MON.
I.P.	PROPERTY MARKER - IRON PIPE
100+00	HISTORIC RIGHT-OF-WAY BASELINE
	EXISTING RIGHT-OF-WAY
PL	EXISTING PROPERTY LINE
EASEMENT TYPE	EXISTING EASEMENT
DA	EXISTING DENIAL OF ACCESS
R/W-DA	EXISTING R/W & DENIAL OF ACCESS

SURVEY CONTROL & MONUMENTATION	
B.M.	SURVEY BENCHMARK LOCATION
T.P.	SURVEY TIE POINT LOCATION
△	SURVEY TRAVERSE POINT
◎	POINT OF CURVATURE OR TANGENCY
◎	POINT OF INTERSECTING TANGENTS

UTILITY	
	SOIL BORING LOCATION
	UTILITY TEST HOLE LOCATION
TV	CABLE TV DISTRIBUTION BOX
Ⓔ	ELECTRIC MANHOLE
EM	ELECTRIC METER
E	ELECTRIC TRANSFORMER
	POLE MOUNTED LUMINAIRE
Ⓖ	GAS MANHOLE
G.M.	GAS METER
G.V.	GAS VALVE
G.P.	GAS PUMP - SERVICE STATION
	RAILROAD TRACKS
Ⓢ	SANITARY SEWER MANHOLE
S.V.	SANITARY SEWER VALVE
SCO	SANITARY SEWER CLEANOUT OR VENT
S.D.F.	SEPTIC DRAIN FIELD
B	TELEPHONE BOOTH
Ⓣ	TELEPHONE MANHOLE
T	TELEPHONE TEST POINT
J.W.	TRAFFIC - CONDUIT JUNCTION WELL
◎	TRAFFIC - LIGHT POLE AND BASE
◎	TRAFFIC - PEDESTRIAN POLE & BASE
	TRAFFIC - SIGNAL CABINET & BASE
⊗	TRAFFIC - SIGNAL POLE AND BASE
U	UTILITY BOX
	UTILITY POLE GUY WIRE ANCHOR
	UTILITY POLE
F.H.	WATER - FIRE HYDRANT
W.M.	WATER METER
W.V.	WATER VALVE
WELL	WELL HEAD
?	MANHOLE - UNDETERMINED OWNER

MISCELLANEOUS	
—DOT-E-DUCT—	EXISTING DELDOT LIGHTING CONDUIT
OH	EXISTING OVERHEAD LINE
ITMS	EXISTING DELDOT FIBER
CO XX	EXISTING CONDUIT
PB XX	EXISTING POLE BASE
JW XX	EXISTING JUNCTION WELL

PROPOSED SYMBOLS

CONSTRUCTION	
	CONCRETE SAFETY BARRIER - PERMANENT
BFS	BIOFILTRATION SWALE
	BRICK PATTERNED SURFACE
	BUTT JOINT
CZ	CLEAR ZONE
100+00	CONSTRUCTION BASELINE
CSF	CONSTRUCTION SAFETY FENCE
	CURB, TYPE 1 & TYPE 3
	CURB, TYPE 2
	CURB & GUTTER, TYPE 1
	CURB & GUTTER, TYPE 2
	CURB & GUTTER, TYPE 3
	CURB & GUTTER, TYPE 4
	CURB OPENING
■	DRAINAGE INLET
	DITCH
	FENCE - METAL
	FENCE - WOOD
	FLARED END SECTION
	GUARDRAIL, TYPE 1
	GUARDRAIL, TYPE 2
	GUARDRAIL, TYPE 3
	GUARDRAIL END ANCHORAGE
	GUARDRAIL END TREATMENT, TYPE 1
	GUARDRAIL END TREATMENT, TYPE 2
	GUARDRAIL END TREATMENT, TYPE 3
	IMPACT ATTENUATOR
■	JUNCTION BOX - DRAINAGE
LO	LATERAL OFFSET
LOC	LIMIT OF CONSTRUCTION
MB	MAILBOX
●	MANHOLE
	PAVEMENT PATCH
	PAVEMENT REMOVAL - TOPSOIL, SEED AND MULCH
	PIPE & DIRECTIONAL FLOW ARROW
	RIPRAP
	P.C.C. SIDEWALK - 4"
	P.C.C. SIDEWALK - 6" (USE 8" DEPTH FOR CHANNELIZATION ISLANDS.)
	UNDERDRAIN
	UNDERDRAIN OUTLET

RIGHT-OF-WAY SYMBOLS	
⊠	PROPOSED RIGHT-OF-WAY MONUMENT
DA	PROPOSED DENIAL OF ACCESS
PE	PROPOSED PERMANENT EASEMENT
R/W	PROPOSED RIGHT-OF-WAY
R/W-DA	PROPOSED R/W & DENIAL OF ACCESS
TCE	TEMPORARY CONSTRUCTION EASEMENT
100+00	PROPOSED RIGHT-OF-WAY BASELINE

IDENTIFIERS	
AC	ADJUST BY CONTRACTOR
AO	ADJUST BY OTHERS
B	CONCRETE SAFETY BARRIER
C	CURB OR CURB & GUTTER
CJB	CONVERT TO JUNCTION BOX
CMH	CONVERT TO DRAINAGE MANHOLE
CO	CURB OPENING
CR	CURB RAMP / TYPE
CR-N	CURB RAMP / TYPE - WITHOUT SIDEWALK SURFACE DETECTABLE WARNING SYSTEM
CSF	CONSTRUCTION SAFETY FENCE
DI	DRAINAGE INLET
DND	DO NOT DISTURB
ED	ENERGY DISSIPATOR
F	FENCE
FES	FLARED END SECTION
FF C	FILL WITH FLOWABLE FILL
FS	FILTRATION STRUCTURE
GR	GUARDRAIL
JB	JUNCTION BOX
MH	MANHOLE
M	MONUMENT - RIGHT-OF-WAY
P	PIPE
RL C	RELOCATE BY CONTRACTOR
RL O	RELOCATE BY OTHERS
RL PO	RELOCATE BY PROPERTY OWNER
RM C	REMOVE BY CONTRACTOR
RM TC	REMOVE BY TRAFFIC CONTRACTOR
RM O	REMOVE BY OTHERS
UD	UNDERDRAIN / LENGTH
UDO	UNDERDRAIN OUTLET PIPE
LST XX	LIGHTING STANDARD IDENTIFIER
CO XX	CONDUIT
PB XX	POLE BASE
JW XX	JUNCTION WELL

LANDSCAPING	
LS	LANDSCAPE PLANTINGS
	SHRUBBERY
	CONIFEROUS TREE
	DECIDUOUS TREE

TRAFFIC	
ITMS-CON	ITMS CONDUIT
SIG-CON	SIGNAL CONDUIT
■ ■	CONDUIT JUNCTION WELL
	LUMINAIRE
	PAVEMENT MARKINGS
	PAVEMENT STRIPING
	TRAFFIC SIGN

PAVEMENT SECTION(S)	
	OVERLAY PAVEMENT - SEE TYPICAL SECTIONS FOR MATERIALS AND DEPTHS
	RECONSTRUCTED PAVEMENT - SEE TYPICAL SECTIONS FOR MATERIALS AND DEPTHS
	DRIVEWAY AND ENTRANCE PAVEMENT - SEE NOTES FOR MATERIALS AND DEPTHS

MISCELLANEOUS	
—DOT-E-DUCT-	LIGHTING CONDUIT
	CABINET
	UNDERBRIDGE LUMINAIRE
P	SERVICE DISCONNECT WITH METER
	LIGHTING POLE BASE

PLOTTED BY: KREHM DATE: 1/27/2020
FILE LOCATION: O:\NDEV\150151_000_TRAFFIC_ENGINEERING_\CADD\4.2_PRICES_CORNER\LG.DGN [SHEET: LG 1]

ADDENDA / REVISIONS

NOT TO SCALE

PRICES CORNER INTERCHANGE
LIGHTING DESIGN

CONTRACT	BRIDGE NO.	X
T201880206	DESIGNED BY: KAB	
COUNTY	CHECKED BY: MAW	
NEW CASTLE		

NOTES AND LEGEND

SECTION	
JMT	
SHEET NO.	
3	

GENERAL NOTES

1. THIS PROJECT IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE DELAWARE DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS", DATED AUGUST 2016 AND THE DELAWARE DEPARTMENT OF TRANSPORTATION "STANDARD CONSTRUCTION DETAILS", DATED 2014, INCLUDING ALL REVISIONS UP TO THE DATE OF ADVERTISEMENT.

2. ELECTRONIC PROJECT FILES THAT WILL BE MADE AVAILABLE TO THE AWARDED CONTRACTOR, INCLUDE:

( )	NONE
( )	ASCII DATA FILES WITH COORDINATES AND ELEVATIONS FOR PROPOSED POINTS AS SELECTED BY THE ENGINEER.
(X)	ALL PLAN SHEETS, IN PDF FORMAT.
( )	EXISTING DIGITAL TERRAIN MODEL, IN .DTM FILE FORMAT, COMPATIBLE WITH SOFTWARE CURRENTLY USED BY DELDOT.
( )	PROPOSED DIGITAL TERRAIN MODEL, IN .DTM FILE FORMAT, COMPATIBLE WITH SOFTWARE CURRENTLY USED BY DELDOT.
( )	DESIGN FILE, IN .DGN FILE FORMAT, CONTAINING ONLY THE PROPOSED 3D TRIANGLES OF THE PROPOSED DIGITAL TERRAIN MODEL (DTM).

NOTE: THE DOCUMENT ENTITLED "RELEASE FOR DELIVERY OF DOCUMENTS IN ELECTRONIC FORM TO A CONTRACTOR" MUST BE SIGNED BY ALL PARTIES PRIOR TO THE DELIVERY OF ANY ELECTRONIC PROJECT FILES.

3. PROJECT FILES THAT WILL BE MADE AVAILABLE TO THE CONTRACTOR, INCLUDE:

( )	CROSS SECTIONS
( )	RIGHT-OF-WAY PLANS (WILL BE MADE AVAILABLE TO THE AWARDED CONTRACTOR.)

PROJECT NOTES

SECTION 200

1. ITEMS TO BE REMOVED UNDER ITEM 211000 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS SHALL INCLUDE, BUT NOT BE LIMITED TO THE FOLLOWING: LIGHT POLES AND ARMS, POLE BASES, TRANSFORMER BASES, CABLES AND ANY OTHER EQUIPMENT DESIGNATED FOR REMOVAL ON THE PLANS THAT IS NOT COVERED UNDER OTHER PAY ITEMS.

SECTION 800

1. THE COST OF ANY FLOODLIGHTING NECESSARY DUE TO WORK BY THE CONTRACTOR ON ANY ITEM OCCURING AFTER DARK SHALL BE INCIDENTAL TO THE BID PRICE OF THE ITEM BEING CONSTRUCTED. DURING NIGHT WORK, ALL PERSONS WITHIN THE WORK ZONE SHALL HAVE SAFETY WEAR IN ACCORDANCE WITH THE DEMUTCD.

2. WHEN PERFORMING ANY EXCAVATION OR BACKFILLING OPERATION, THE CONTRACTOR SHALL PROVIDE DEWATERING MEASURES AT ALL TIMES TO KEEP THE GROUNDWATER LEVEL AT LEAST ONE FOOT BELOW THE EXCAVATION ELEVATION, IN COMPLIANCE WITH DELDOT STANDARD SPECIFICATIONS, SECTION 906 - DEWATERING OPERATIONS. THE CONTRACTOR SHALL ALSO PROVIDE NECESSARY DEWATERING TO STABILIZE EXCAVATED SLOPES DURING CONSTRUCTION UNTIL THE SLOPES ARE STABILIZED AS DETERMINED BY THE ENGINEER. THERE SHALL NOT BE ANY SEPARATE PAYMENT FOR DEWATERING AND ALL COSTS SHALL BE INCIDENTAL TO ITEM 834006 - POLE BASE, TYPE 6.

LIGHTING GENERAL NOTES

1. ALL GROUND WIRE CONNECTIONS TO GROUND RODS SHALL BE COMPLETED USING EXOTHERMIC WELDS.

2. THE CONTRACTOR SHALL COORDINATE WITH THE ENGINEER ON THE LOCATIONS OF ALL CONDUIT JUNCTION WELLS, POLE BASES, AND EQUIPMENT BASES TO ELIMINATE CONSTRUCTION CONFLICTS. THE CONTRACTOR SHALL STAKE ALL PROPOSED EQUIPMENT LOCATIONS FOR APPROVAL BY THE ENGINEER BEFORE INSTALLATION. THE LOCATION OF EXISTING CONDUITS HAVE BEEN SURVEYED AND ARE SHOWN WITHIN 25' OF THE PROPOSED POLE LOCATIONS FOR THE EASE OF CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND PREVENTING DAMAGE TO THEM, AND MAINTAINING THEM IN SERVICE WHEN AND WHERE REQUIRED. THE CONTRACTOR SHALL VERIFY THE EXACT LOCATIONS PRIOR TO COMMENCING WORK. BURIED ELECTRICAL CABLE AND CONDUIT, AND OTHER UTILITES, MAY EXIST THROUGHOUT THIS PROJECT. THE EXISTING UTILITY LOCATIONS SHOWN ON THE PLANS ARE APPROXIMATE. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING UTILITIES BY HAND EXCAVATION PRIOR TO TRENCHING BY MACHINE.

3. LOCATION OF CONDUIT MAY BE ADJUSTED IN THE FIELD TO AVOID EXISTING OR OTHER PROPOSED CONSTRUCTION FEATURES, SUBJECT TO APPROVAL BY THE ENGINEER. ALL CONDUITS AND POLES SHALL BE LOCATED WITHIN EXISTING RIGHT-OF-WAY OR PERMANENT EASEMENT.

4. COLOR CODING SHALL BE PROVIDED THROUGHOUT THE ENTIRE NETWORK OF CABLES FOR SERVICE, FEEDER, BRANCH, AND CONTROL CONDUCTORS. EACH PHASE SHALL BE AN INDEPENDENT COLOR. CONDUCTORS SHALL HAVE FACTORY IMPREGNATED COLOR THROUGHOUT THEIR ENTIRE LENGTH.

5. ALL FUSED CONNECTIONS SHALL BE MADE IN THE POLE BASE. SPLICES IN JUNCTION BOXES OR PULL BOXES SHALL NOT BE FUSED.

6. ALL CONDUITS SHALL BE BONDED IN A CONTINUOUS RUN FROM THE SOURCE BY A COPPER GROUNDING CONDUCTOR WITH SIZE AS NOTED ON PLANS. 10 FEET OF ADDITIONAL SLACK FOR EACH GROUND WIRE IN EACH JUNCTION WELL SHALL BE PROVIDED AND NEATLY COILED.

7. UNLESS OTHERWISE NOTED, CONTRACTORS SHALL RUN UNSPLICED, CONTINUOUS CABLE FROM POINT OF SERVICE TO LIGHT POLE BASE, AND FROM LIGHT POLE BASE TO LIGHT POLE BASE.

LIGHTING GENERAL NOTES (CONT'D)

8. ALL NORTHING AND EASTING INFORMATION SHOWN FOR PROPOSED LIGHTING STANDARDS IS TO THE CENTER OF THE PROPOSED POLE BASE.

9. ALL PROPOSED CONDUITS (SERVICE RUNS) SHALL BE RIGID POLYVINYL CHLORIDE SCHEDULE 80 WHEN INSTALLED BY TRENCHING AND SCHEDULE 80 HDPE WHEN INSTALLED BY BORING, UNLESS OTHERWISE NOTED ON PLANS.

10. SPLICES FOR ALL ROADWAY LIGHTING ELECTRICAL CABLES SHALL BE COMPLETED USING APPROVED SPLICE KITS OR METHODS APPROVED BY THE ENGINEER AND SHALL BE INCIDENTAL TO THE SUPPLY AND INSTALLATION OF THE VARIOUS ROADWAY LIGHTING ELECTRICAL CABLES. THE METHOD OF SPLICING AT JUNCTION WELLS AND POLE BASES SHALL BE COORDINATED WITH WAYNE CONTE, MASTER ELECTRICIAN IN THE NORTH DISTRICT AT 302-803-1447. BUCHANN BOOT KITS SHALL BE PLACED ON THE T-BASE.

11. (1) 3/4" DIAMETER BY 10' LONG GROUND ROD SHALL BE INSTALLED AT EACH LIGHTING STANDARD POLE BASE, IN THE JUNCTION WELL CLOSEST TO THE LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE, AT THE LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE, AND AT THE ELECTRIC SERVICE PEDESTAL. GROUND RODS SHALL BE SEPARATED BY A MINIMUM OF 6 FEET.

12. ALL PROPOSED ROADWAY LIGHTING CONDUITS SHALL BE SEALED WITH A DUCT SEAL/WATER BLOCK FOAM (POLYWATER FST OR APPROVED EQUAL). SEALING LIGHTING CONDUITS WILL NOT BE MEASURED AND PAID FOR BUT WILL BE INCIDENTAL TO THE PERTINENT FURNISH AND INSTALL ELECTRICAL CABLE ITEMS. ALL LIGHTING CONDUIT ENDS IN JUNCTION WELLS AND POLE BASES SHALL BE SEALED WITH PEST DETERRING FOAM, THE TYPE OF WHICH SHALL BE SPECIFIED BY DELDOT MAINTENANCE AND OPERATIONS.

13. ALL LIGHTING JUNCTION WELLS SHALL BE TYPE 1, UNLESS OTHERWISE NOTED.

14. ALL LIGHTING STANDARD POLE BASES SHALL BE TYPE 6, UNLESS OTHERWISE NOTED.

15. ALL LIGHT FIXTURES ON STAND ALONE POLES AND ON UTILITY POLES SHALL BE LED FIXTURES.

16. FOR FINAL CONNECTION TO LIGHT FIXTURES, AND LIGHT STANDARD FIXTURE DETAILS, SEE TYPICAL LUMINAIRE CONNECTIONS ON LIGHTING DETAIL SHEET LI-14.

17. FOR ACCESS TO DELDOT OWNED LIGHTING EQUIPMENT, CONTACT WAYNE CONTE (MONDAY TO FRIDAY, 8 AM TO 4 PM, 302-803-1447) AT THE NORTH DISTRICT FACILITY AT LEAST 48 HOURS IN ADVANCE.

18. THE CONTRACTOR SHALL VERIFY THAT THE REMOVAL OF AN EXISTING JUNCTION WELL DESIGNATED TO BE REMOVED OR ABANDONED, OR EXISTING ELECTRICAL CONDUITS AND CABLES DESIGNATED TO BE ABANDONED WILL NOT ADVERSELY AFFECT EXISTING EQUIPMENT TO REMAIN PRIOR TO REMOVAL OR ABANDONING OF EQUIPMENT AS SHOWN ON PLANS.

19. THE EXISTING LIGHTING SYSTEM SHALL BE MAINTAINED AS LONG AS THE PHASING ALLOWS AND REMAIN OPERATIONAL UNTIL THE PROPOSED LIGHTING SYSTEM IS CONSTRUCTED AND CONNECTION TO THE FINAL POWER SOURCE IS COMPLETED. OUTAGES TO THE ROADWAY LIGHTING ARE EXPECTED WHEN TRANSITIONING FROM THE EXISTING TO THE PROPOSED SYSTEMS. OUTAGES SHALL BE MINIMIZED TO THE FULLEST EXTENT POSSIBLE.

20. ALL EXISTING LIGHTING CONDUITS WITHIN THE PROJECT LIMITS SHALL BE ABANDONED, UNLESS OTHERWISE NOTED. ALL EXISTING CABLES POWERING THE EXISTING LIGHTING WITHIN THE PROJECT LIMITS SHALL BE REMOVED AS PART OF THIS PROJECT, AND AS DIRECTED BY THE ENGINEER. THE EXISTING CONDUITS SHALL BE CAPPED AND ABANDONED IN PLACE.

21. ALL EXISTING LUMINAIRES, LIGHT POLES, AND TRANSFORMER BASES WITHIN THE PROJECT LIMITS SHALL BE REMOVED, UNLESS OTHERWISE NOTED.

22. ALL FOUNDATIONS FOR EXISTING LIGHT POLES OR EQUIPMENT DESIGNATED TO BE REMOVED SHALL BE REMOVED TO A DEPTH OF 1'-0" BELOW FINISHED GRADE. THE AREA SHALL BE BACKFILLED, AND SEEDED. THIS SHALL BE PAID FOR BY ITEMS 209006 - BORROW, TYPE F: 908004 - TOPSOIL, 6" DEPTH: AND 908014 - PERMANENT GRASS SEEDING, DRY GROUND.

23. REMOVAL OF EXISTING LUMINAIRES SHALL BE PAID UNDER ITEM 850011 - REMOVAL OF LUMINAIRE.

24. REMOVAL OF EXISTING JUNCTION WELLS SHALL BE PAID UNDER ITEM 830010 - REMOVAL OF EXISTING JUNCTION WELLS. HOLES LEFT BEHIND FROM EXISTING JUNCTION WELLS BEING REMOVED FROM THE PROJECT LIMITS SHALL BE BACKFILLED AS PART OF ITEM 830010.

25. EXISTING LIGHT POLES, DAVIT ARMS, TRANSFORMER BASES, JUNCTION WELLS, AND LUMINAIRES BEING REMOVED SHALL BE SALVAGED AND DELIVERED TO DELDOT NORTH DISTRICT MAINTENANCE SHOP, 39 EAST REGAL BLVD, NEWARK, DELAWARE, UNLESS OTHERWISE NOTED.

26. THE CONTRACTOR IS RESPONSIBLE FOR PLACING A COPY OF THE PLANS (COMPLETE WITH AS BUILT MARKUPS) INTO A PLASTIC, WATERPROOF JACKET INSIDE THE CABINET PRIOR TO THE ACCEPTION OF THE PROJECT BY DELDOT. THE CONTRACTOR SHALL INFORM THE DESIGNER OF ANY NECESSARY DESIGN CHANGES FOR APPROVAL OF THE ENGINEER PRIOR TO INSTALLATION. AFTER CONSTRUCTION IS COMPLETE AND THE PROJECT HAS BEEN ACCEPTED, THE DESIGNER SHALL UPDATE THE CADD VERSION OF THE PLANS TO REFLECT THE AS-BUILT CONDITION. THE DESIGNER WILL THEN SEND THE UPDATED AS-BUILT PLANS TO NORTH DISTRICT MAINTENANCE SO THEY CAN REPLACE THE MARKED-UP COPY OF THE PLANS IN THE CABINET.

27. NO SEPARATE PHOTOMETRIC ANALYSIS WAS PERFORMED FOR THE UNDERBRIDGE LUMINAIRES. ANY UNDERBRIDGE LUMINAIRES THAT ARE DESIGNATED IN THE SCHEDULES TO BE REPLACED SHOULD BE REPLACED ONE-TO-ONE.

UTILITY GENERAL NOTES

1. EXISTING UTILITY LOCATIONS SHOWN ON THE PLANS ARE APPROXIMATE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXACT LOCATIONS PRIOR TO COMMENCING WORK.

2. IF ANY UTILITY IS DAMAGED THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE OWNER OF THE UTILITY IMMEDIATELY. ANY DAMAGE TO THE UTILITIES SHALL BE REPAIRED BY THE CONTRACTOR AT HIS EXPENSE, UNDER THE DIRECTION OF THE UTILITY OWNER.

3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATION OF CONDUITS, JUNCTION WELLS, ELECTRICAL CABLES, CABLE SPLICES, CABLE TERMINATIONS, AND TRANSFORMER PADS FOR THE DESIGN. DELMARVA POWER WILL COMPLETE FINAL CABLE CONNECTIONS, INSTALL NEW TRANSFORMERS AND REMOVE EXISTING TRANSFORMERS AS NECESSARY. THE CONTRACTOR SHALL COORDINATE ALL CONSTRUCTION FOR THE POWER CONNECTION WITH DELMARVA POWER AND ENSURE THE LOCATION OF ALL PROPOSED EQUIPMENT IS APPROVED PRIOR TO INSTALLATION.

4. THE CONTRACTOR SHALL COMPLETE HIS PORTION OF THE WORK FOR THE NEW SERVICE LINE PRIOR TO REQUESTING DE-ENERGIZATION OF THE EXISTING LINE AND ENERGIZATION OF THE NEW LINE BY DELMARVA POWER SO THAT DOWN TIME IS MINIMIZED. THE CONTRACTOR SHALL ARRANGE A MEETING WITH DELMARVA POWER, DELDOT NORTH DISTRICT AND THE ENGINEER TO COORDINATE THE SERVICE TRANSITION AND ENSURE THE POWER IS AVAILABLE WHEN REQUIRED.

5. THE CONTRACTOR SHALL COORDINATE ALL WORK INVOLVING DELMARVA POWER WITH TOM SMITH (302-283-5757).

TRAFFIC CONTROL NOTES

1. NO EQUIPMENT SHALL BE STORED IN THE MEDIAN, OR WITHIN THE CLEAR ZONE, AT ANY TIME DURING NON-WORKING HOURS.

2. MAINTENANCE OF TRAFFIC DURING CONSTRUCTION ACTIVITIES OR OTHER OPERATIONS SHALL CONFORM TO TYPICAL APPLICATIONS 5A, 5B, 21, 23, 33, 42, 43, 44 AND ANY ADDITIONAL TYPICAL APPLICATIONS NEEDED AS SHOWN IN PART 6 OF THE DELAWARE MUTCD, AS DIRECTED BY THE ENGINEER.

3. THE FOLLOWING LANE CLOSURE MATRIX INDICATES THE ALLOWABLE TIMES FOR SINGLE LANE CLOSURES ON SR 141, SR 2 (KIRKWOOD HIGHWAY) AND CENTERVILLE ROAD.

4. UTILIZE PEDESTRIAN FLAGGERS TO MAINTAIN PEDESTRIAN ACCESS AS NECESSARY, WHENEVER WORK IMPACTS SIDEWALKS OR CROSSWALKS.

5. LANE CLOSURES SHALL NOT BE PERMITTED DURING STATE HOLIDATS AND MAJORS EVENTS AS LISTED IN SECTION 801000 OF THE DELDOT STANDARD SPECIFICATIONS.

6. THE DEPARTMENT RESERVES THE RIGHT TO RESTRICT DAY TIME CLOSURES, SHOULD THERE BE EXCESSIVE QUEUES THAT RESULT IN DELAYS.

Off-Peak Lane Closures

	12:00 AM	1:00 AM	2:00 AM	3:00 AM	4:00 AM	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM
SUNDAY	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
MONDAY	■	■	■	■	■	■	□	□	□	■	■	■	■	■	■	□	□	□	□	■	■	■	■	■
TUESDAY	■	■	■	■	■	■	□	□	□	■	■	■	■	■	■	□	□	□	□	■	■	■	■	■
WEDNESDAY	■	■	■	■	■	■	□	□	□	■	■	■	■	■	■	□	□	□	□	■	■	■	■	■
THURSDAY	■	■	■	■	■	■	□	□	□	■	■	■	■	■	■	□	□	□	□	■	■	■	■	■
FRIDAY	■	■	■	■	■	■	□	□	□	■	■	■	■	■	■	□	□	□	□	■	■	■	■	■
SATURDAY	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

■ lane closed
□ lane open

ADDENDA / REVISIONS		NOT TO SCALE	PRICES CORNER INTERCHANGE LIGHTING DESIGN	CONTRACT	BRIDGE NO.	X	NOTES AND LEGEND	PN-01
				T201880206	DESIGNED BY: KAB			SECTION: JMT
				COUNTY: NEW CASTLE	CHECKED BY: MAW			SHEET NO.: 4

LIGHTING STANDARD SCHEDULE

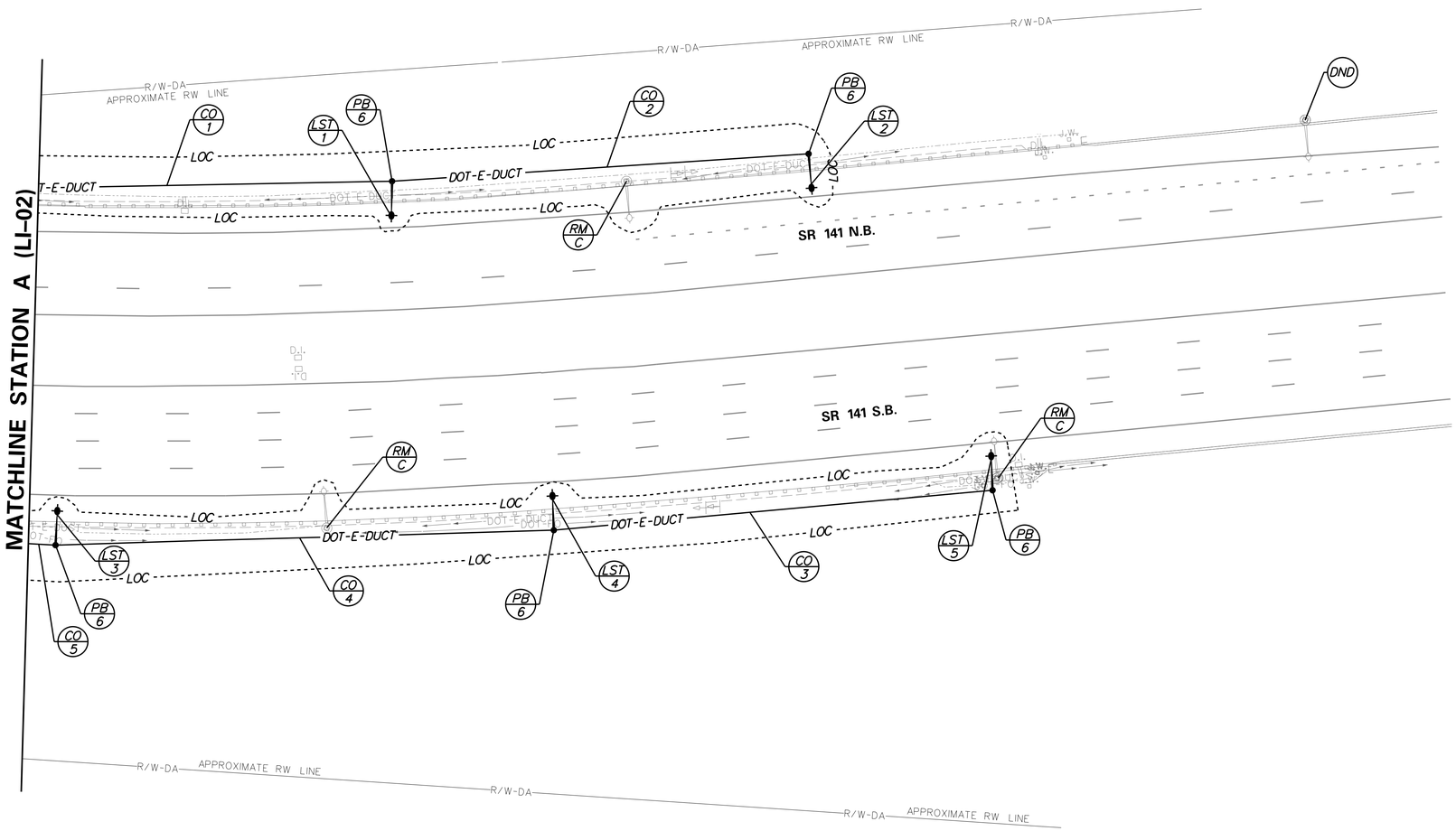
NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	LIGHT DISTRIBUTION
1	B3	630634.9303	598843.6772	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
2	B2	630468.4324	598919.3303	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
3	B2	630716.5658	598642.3795	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
4	B3	630514.6452	598725.5891	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
5	B1	630340.9677	598809.8080	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2

W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM

LIGHTING SERVICE SCHEDULE

CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-1	1	3.0"	190'	T	(3) #6 + (1) #6 GND
CO-2	1	3.0"	185'	T	(2) #6 + (1) #6 GND
CO-3	1	3.0"	195'	T	(2) #6 + (1) #6 GND
CO-4	1	3.0"	220'	T	(3) #6 + (1) #6 GND
CO-5	1	3.0"	170'	T	(4) #6 + (1) #6 GND

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
B = BORE, T = TRENCH, O = OPEN CUT



NOTE:
1. DO NOT DISTURB EXISTING FIBER LINE ALONG SR 141 SOUTHBOUND.

PLOTTED BY: KREHM DATE: 1/27/2020
FILE LOCATION: Q:\NDE\150151_000_TRAFFIC_ENGINEERING_\CADD\4.2_PRICES CORNER\LI.DGN [SHEET: LI01]

ADDENDA / REVISIONS	

SCALE
0 30 60 90
FEET

PRICES CORNER INTERCHANGE
LIGHTING DESIGN

CONTRACT	BRIDGE NO.	X
T201880206	DESIGNED BY: KAB	
COUNTY	CHECKED BY: MAW	
NEW CASTLE		

LIGHTING PLAN

	LI-01
SECTION	JMT
SHEET NO.	5

LIGHTING STANDARD SCHEDULE

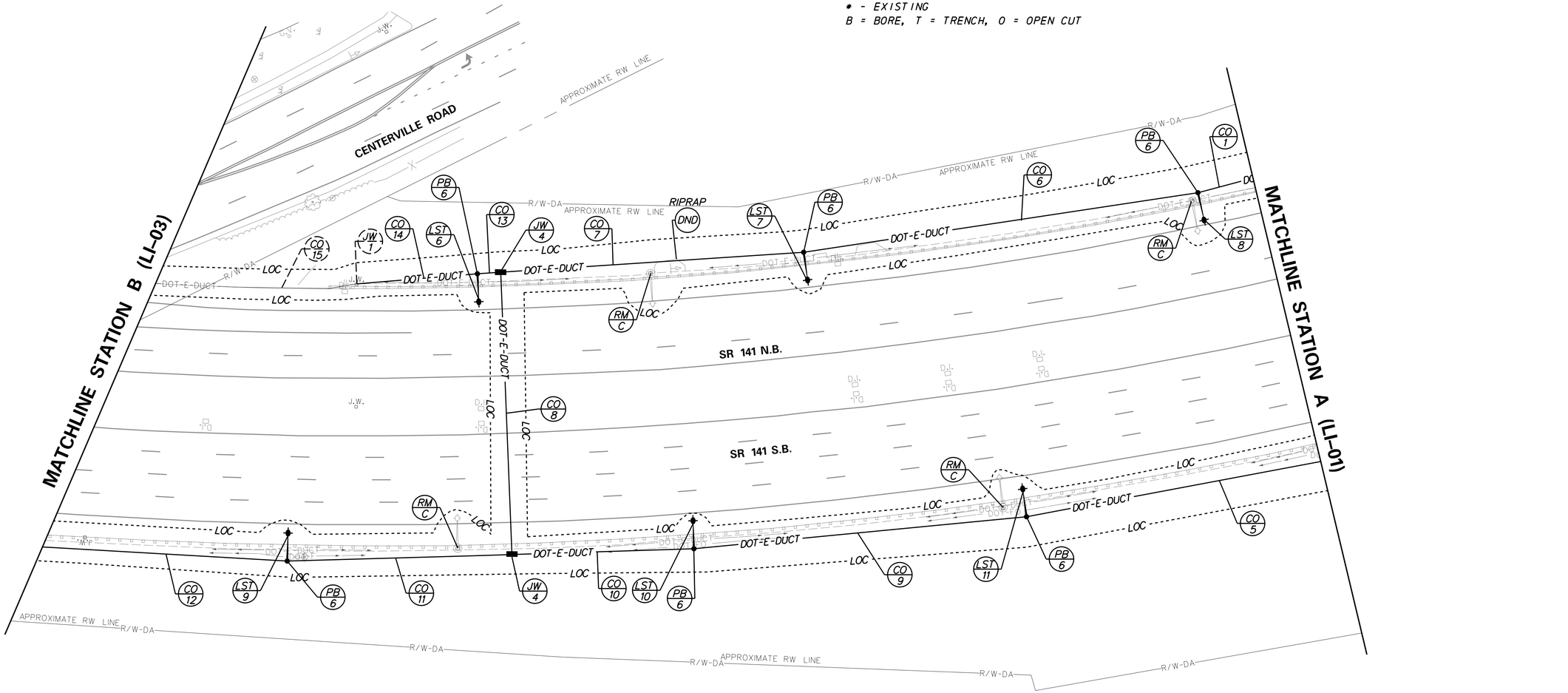
NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	LIGHT DISTRIBUTION
6	B3	631186.3883	598685.1856	15′	40′ ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
7	B2	631014.2726	598717.5232	15′	40′ ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
8	B1	630808.4133	598774.4521	15′	40′ ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
9	B2	631269.1195	598520.3067	15′	40′ ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
10	B3	631053.6285	598552.9256	15′	40′ ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
11	B1	630878.7973	598591.2514	15′	40′ ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2

W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM

LIGHTING SERVICE SCHEDULE

CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-1	INFORMATION SHOWN ON SHEET LI-01				
CO-5	INFORMATION SHOWN ON SHEET LI-01				
CO-6	1	3.0″	215′	T	(4) #6 + (1) #6 GND
CO-7	1	3.0″	165′	T	(4) #6 + (1) #6 GND
CO-8	1 (SCH 80 HDPE)	4.0″	155′	B	(4) #6 + (1) #6 GND
CO-9	1	3.0″	180′	T	(4) #6 + (1) #6 GND
CO-10	1	3.0″	100′	T	(4) #6 + (1) #6 GND
CO-11	1	3.0″	125′	T	(3) #6 + (1) #6 GND
CO-12	1	3.0″	205′	T	(2) #6 + (1) #6 GND
CO-13	1	3.0″	15′	T	(4) #6 + (1) #6 GND
CO-14	1	3.0″	65′	T	(4) #6 + (1) #6 GND
*CO-15	1	EX.	130′	-	NEW [(4) #6 + (1) #6 GND]

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
* - EXISTING
B = BORE, T = TRENCH, O = OPEN CUT



NOTES:
1. CONDUIT #14 SHALL BE INSTALLED INTO THE EXISTING JUNCTION WELL AT APPROXIMATELY 631250.0118 NORTHING AND 598671.9520 EASTING. CONDUIT #15 IS AN EXISTING CONDUIT INSTALLED IN THE BRIDGE PARAPET THAT IS TO REMAIN. THE EXISTING CABLES SHOULD BE REMOVED FROM CONDUIT #15 AND THE NEW CABLES SHOULD BE INSTALLED ACCORDING TO THE SCHEDULE.

ADDENDA / REVISIONS

SCALE 0 30 60 90 FEET

PRICES CORNER INTERCHANGE LIGHTING DESIGN

CONTRACT T201880206
COUNTY NEW CASTLE
BRIDGE NO. X
DESIGNED BY: KAB
CHECKED BY: MAW

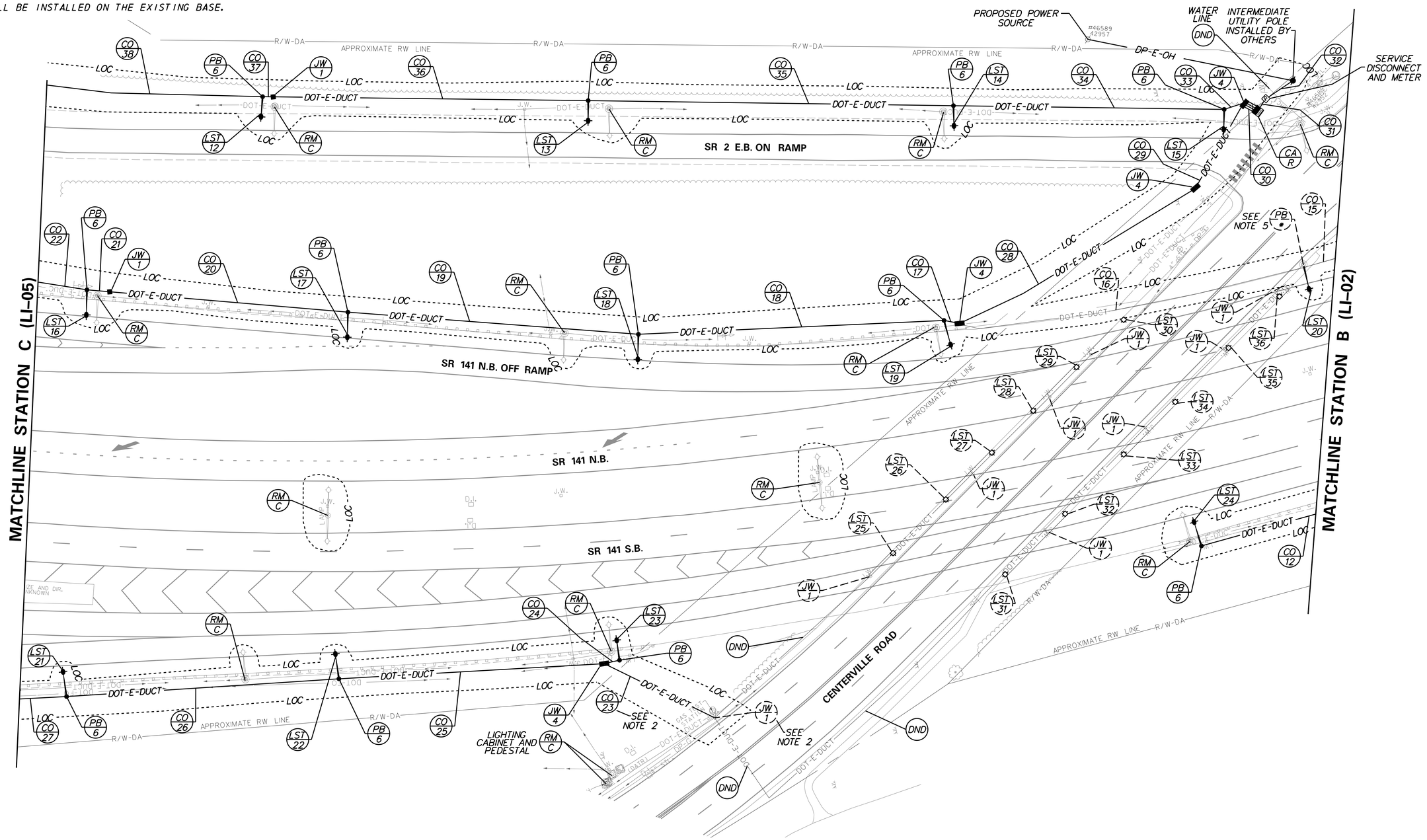
LIGHTING PLAN

LI-02
SECTION JMT
SHEET NO. 6

PLOTTED BY: KREHM DATE: 1/27/2020
FILE LOCATION: Q:\NDE\150151_000_TRAFFIC_ENGINEERING_\CADD\4.2_PRICES CORNER\LI.DGN [SHEET: LI02]

NOTES:
1. FOR SCHEDULES FOR ALL EQUIPMENT ON THIS SHEET, SEE LI-04
2. INSTALL CONDUIT #23 FROM THE PROPOSED JUNCTION WELL ALONG SR 141 SOUTHBOUND TO THE EXISTING JUNCTION WELL ALONG CENTERVILLE ROAD. THE CABLES SHALL BE SPLICED INTO THE CABLE DUCT CABLES POWERING THE UNDERBRIDGE LIGHTS HERE.
3. THE EXISTING DIRECT BURIAL CABLES AND JUNCTION WELLS RUNNING FROM THE EXISTING JUNCTION WELL ALONG CENTERVILLE ROAD TO THE UNDERBRIDGE LIGHTS ALONG CENTERVILLE ROAD UNDER SR 141 SHALL NOT BE DISTRUBED. THE UNDERBRIDGE LIGHTS SHALL REMAIN AS IS.
4. DO NOT DISTURB THE EXISTING CABLE DUCTS THAT CONNECT TO THE UNDERBRIDGE LIGHTS IN THIS AREA.
5. THE EXISTING POLE BASE OF LST #20 SHALL NOT BE DISTURBED. A NEW POLE AND LUMINAIRE SHALL BE INSTALLED ON THE EXISTING BASE.

NOTES (CONT'D):
6. DO NOT DISTURB THE EXISTING FIBER LINE THAT RUNS ALONG SR 141 SOUTHBOUND.
7. THE EXISTING LIGHT POLES ALONG THE MEDIAN BETWEEN SR 141 NORTHBOUND AND SR 141 SOUTHBOUND SHOULD BE REMOVED. THE CONTRACTOR SHALL NOT DAMAGE THE MEDIAN DURING THE REMOVAL OF THE LIGHT POLES.
8. CONDUITS #15 AND #16 ARE EXISTING IN THE BRIDGE PARAPET AND SHOULD REMAIN. THE EXISTING CABLES IN THESE CONDUITS SHALL BE REMOVED AND THE NEW CABLES SHALL BE INSTALLED PER THE SCHEDULE.



ADDENDA / REVISIONS		SCALE 0 30 60 90 FEET	PRICES CORNER INTERCHANGE LIGHTING DESIGN	CONTRACT T201880206	BRIDGE NO. X	LIGHTING PLAN	LI-03
				COUNTY NEW CASTLE	DESIGNED BY: KAB		SECTION JMT
					CHECKED BY: MAW		SHEET NO. 7

PLOTTED BY: KREHM DATE: 1/27/2020
FILE LOCATION: Q:\NDE\150151_000_TRAFFIC_ENGINEERING_\CADD\4.2_PRICES_CORNER\LI.DGN [SHEET: LI03]

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	DISTRIBUTION
12	A3	631965.2098	598888.0101	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
13	A1	631774.9024	598845.1123	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
14	A2	631561.5348	598796.5606	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
15	A3	631403.3395	598760.6311	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
16	A3	632092.2379	598796.7320	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
17	A1	631942.0890	598751.1286	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
18	A2	631774.7103	598701.9281	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
19	A3	631593.8473	598671.9079	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
20	B1	631376.3189	598659.9067	*15'	*40' ALUMINUM LIGHTING POLE	*PARAPET	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
21	B1	632154.9136	598560.9510	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
22	B2	631993.0910	598537.3757	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
23	B3	631826.3414	598513.3006	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
24	B1	631471.1223	598507.6564	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2

W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM
* - EXISTING

UNDERBRIDGE LIGHTING SCHEDULE

NO.	CIRCUIT NO.	NORTHING	EASTING	LIGHT STANDARD	LUMINAIRE
*25	B1	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*26	B2	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*27	B3	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*28	B1	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*29	B2	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*30	B3	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*31	B1	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*32	B2	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*33	B3	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*34	B1	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*35	B2	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*36	B3	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE

* - EXISTING

LIGHTING SERVICE SCHEDULE

CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-12	INFORMATION SHOWN ON SHEET LI-02				
CO-15	INFORMATION SHOWN ON SHEET LI-02				
*CO-16	1	EX.	215'	-	NEW [(4) #6 + (1) #6 GND]
CO-17	1	3.0"	15'	T	(8) #6 + (1) #6 GND
CO-18	1	3.0"	185'	T	(8) #6 + (1) #6 GND
CO-19	1	3.0"	175'	T	(8) #6 + (1) #6 GND
CO-20	1	3.0"	145'	T	(8) #6 + (1) #6 GND
CO-21	1	3.0"	15'	T	(8) #6 + (1) #6 GND
CO-22	1	3.0"	145'	T	(8) #6 + (1) #6 GND
CO-23	1	4.0"	80'	T	(4) #6 + (1) #6 GND
CO-24	1	3.0"	15'	T	(2) #6 + (1) #6 GND
CO-25	1	3.0"	160'	T	(4) #6 + (1) #6 GND
CO-26	1	3.0"	165'	T	(4) #6 + (1) #6 GND
CO-27	1	3.0"	165'	T	(4) #6 + (1) #6 GND
CO-28	1	4.0"	160'	T	(8) #6 + (1) #6 GND
CO-29	1 (SCH 80 HDPE)	4.0"	60'	B	(8) #6 + (1) #6 GND
CO-30	4**	4.0"	15'	T	(8) #6 + (4) #6 GND
CO-31	1 (GALV. STEEL)	2.0"	10'	T	(4) #2 + (1) #2 GND
CO-32	1 (GALV. STEEL)	2.0"	20'	T	(4) #2 + (1) #2 GND
CO-33	1	3.0"	15'	T	(4) #6 + (1) #6 GND
CO-34	1	3.0"	165'	T	(4) #6 + (1) #6 GND
CO-35	1	3.0"	220'	T	(4) #6 + (1) #6 GND
CO-36	1	3.0"	190'	T	(4) #6 + (1) #6 GND
CO-37	1	3.0"	10'	T	(4) #6 + (1) #6 GND
CO-38	1	3.0"	195'	T	(4) #6 + (1) #6 GND

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
B = BORE, T = TRENCH, O = OPEN CUT
* - EXISTING
** - THE 8 LIVE WIRES SHALL BE INSTALLED IN ONE CONDUIT. ONE GROUND WIRE SHALL BE INSTALLED IN EACH OF THE 4 CONDUITS.

NOTES:
1. THE EXISTING LED WALLPACKS ALONG CENTERVILLE ROAD UNDER SR 141 ARE 102 WATTS. THESE LIGHTS SHOULD BE MAINTAINED AS IS.

ADDENDA / REVISIONS

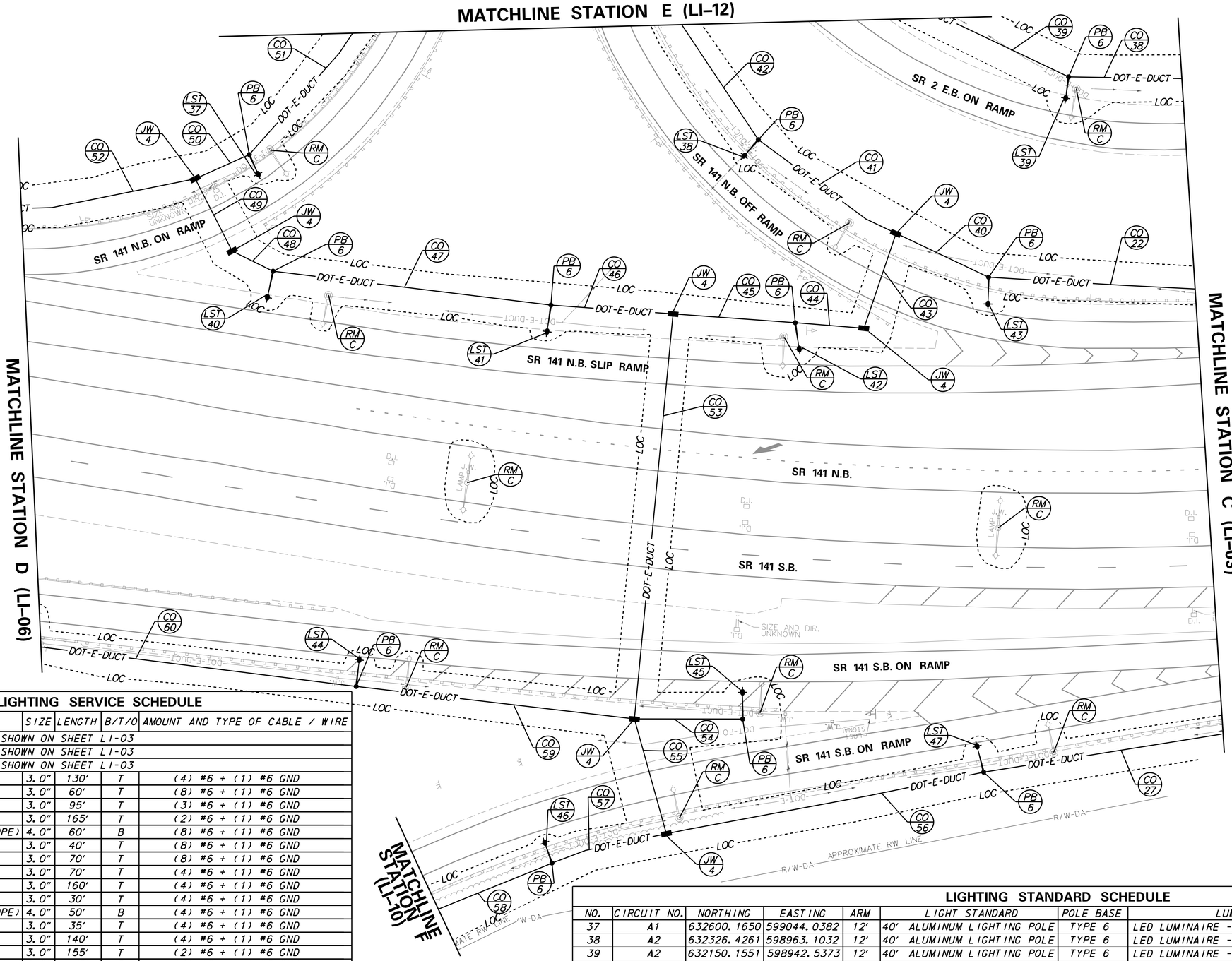
SCALE 0 30 60 90 FEET

PRICES CORNER INTERCHANGE
LIGHTING DESIGN

CONTRACT T201880206
COUNTY NEW CASTLE
BRIDGE NO. X
DESIGNED BY: KAB
CHECKED BY: MAW

LIGHTING PLAN

LI-04
SECTION JMT
SHEET NO. 8



NOTES
1. THE EXISTING LIGHT POLES ALONG THE MEDIAN BETWEEN SR 141 NORTHBOUND AND SR 141 SOUTHBOUND SHOULD BE REMOVED. THE CONTRACTOR SHALL NOT DAMAGE THE MEDIAN DURING THE REMOVAL OF THE LIGHT POLES.

LIGHTING SERVICE SCHEDULE

CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-22	INFORMATION SHOWN ON SHEET LI-03				
CO-27	INFORMATION SHOWN ON SHEET LI-03				
CO-38	INFORMATION SHOWN ON SHEET LI-03				
CO-39	1	3.0"	130'	T	(4) #6 + (1) #6 GND
CO-40	1	3.0"	60'	T	(8) #6 + (1) #6 GND
CO-41	1	3.0"	95'	T	(3) #6 + (1) #6 GND
CO-42	1	3.0"	165'	T	(2) #6 + (1) #6 GND
CO-43	1 (SCH 80 HDPE)	4.0"	60'	B	(8) #6 + (1) #6 GND
CO-44	1	3.0"	40'	T	(8) #6 + (1) #6 GND
CO-45	1	3.0"	70'	T	(8) #6 + (1) #6 GND
CO-46	1	3.0"	70'	T	(4) #6 + (1) #6 GND
CO-47	1	3.0"	160'	T	(4) #6 + (1) #6 GND
CO-48	1	3.0"	30'	T	(4) #6 + (1) #6 GND
CO-49	1 (SCH 80 HDPE)	4.0"	50'	B	(4) #6 + (1) #6 GND
CO-50	1	3.0"	35'	T	(4) #6 + (1) #6 GND
CO-51	1	3.0"	140'	T	(4) #6 + (1) #6 GND
CO-52	1	3.0"	155'	T	(2) #6 + (1) #6 GND
CO-53	1 (SCH 80 HDPE)	4.0"	230'	B	(4) #6 + (1) #6 GND
CO-54	1	3.0"	65'	T	(2) #6 + (1) #6 GND
CO-55	1 (SCH 80 HDPE)	4.0"	70'	B	(4) #6 + (1) #6 GND
CO-56	1	3.0"	185'	T	(4) #6 + (1) #6 GND
CO-57	1	3.0"	70'	T	(4) #6 + (1) #6 GND
CO-58	1	3.0"	165'	T	(4) #6 + (1) #6 GND
CO-59	1	3.0"	160'	T	(3) #6 + (1) #6 GND
CO-60	1	3.0"	190'	T	(2) #6 + (1) #6 GND

NOTE: ALL CONDUIT SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED
B=BORE, T=TRENCH, O=OPEN CUT

W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	LIGHT DISTRIBUTION
37	A1	632600.1650	599044.0382	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
38	A2	632326.4261	598963.1032	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 4
39	A2	632150.1551	598942.5373	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
40	A3	632607.8920	598977.6793	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
41	A1	632465.7950	598911.1330	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
42	A2	632338.7329	598859.2058	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
43	A2	632227.7968	598849.6316	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 4
44	B2	632636.0902	598741.9150	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
45	B3	632435.9317	598657.0276	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
46	B2	632562.6178	598613.5810	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
47	B3	632316.8739	598586.7524	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4

ADDENDA / REVISIONS

SCALE
0 30 60 90
FEET

PRICES CORNER INTERCHANGE
LIGHTING DESIGN

CONTRACT T201880206
BRIDGE NO. X
DESIGNED BY: KAB
COUNTY NEW CASTLE
CHECKED BY: MAW

LIGHTING PLAN

LI-05
SECTION JMT
SHEET NO. 9

PLOTTED BY: KREHM DATE: 1/27/2020
FILE LOCATION: Q:\NDE\150151_000_TRAFFIC_ENGINEERING_\CADD\4.2_PRICES CORNER\LI.DGN [SHEET: LI05]

LIGHTING SERVICE SCHEDULE

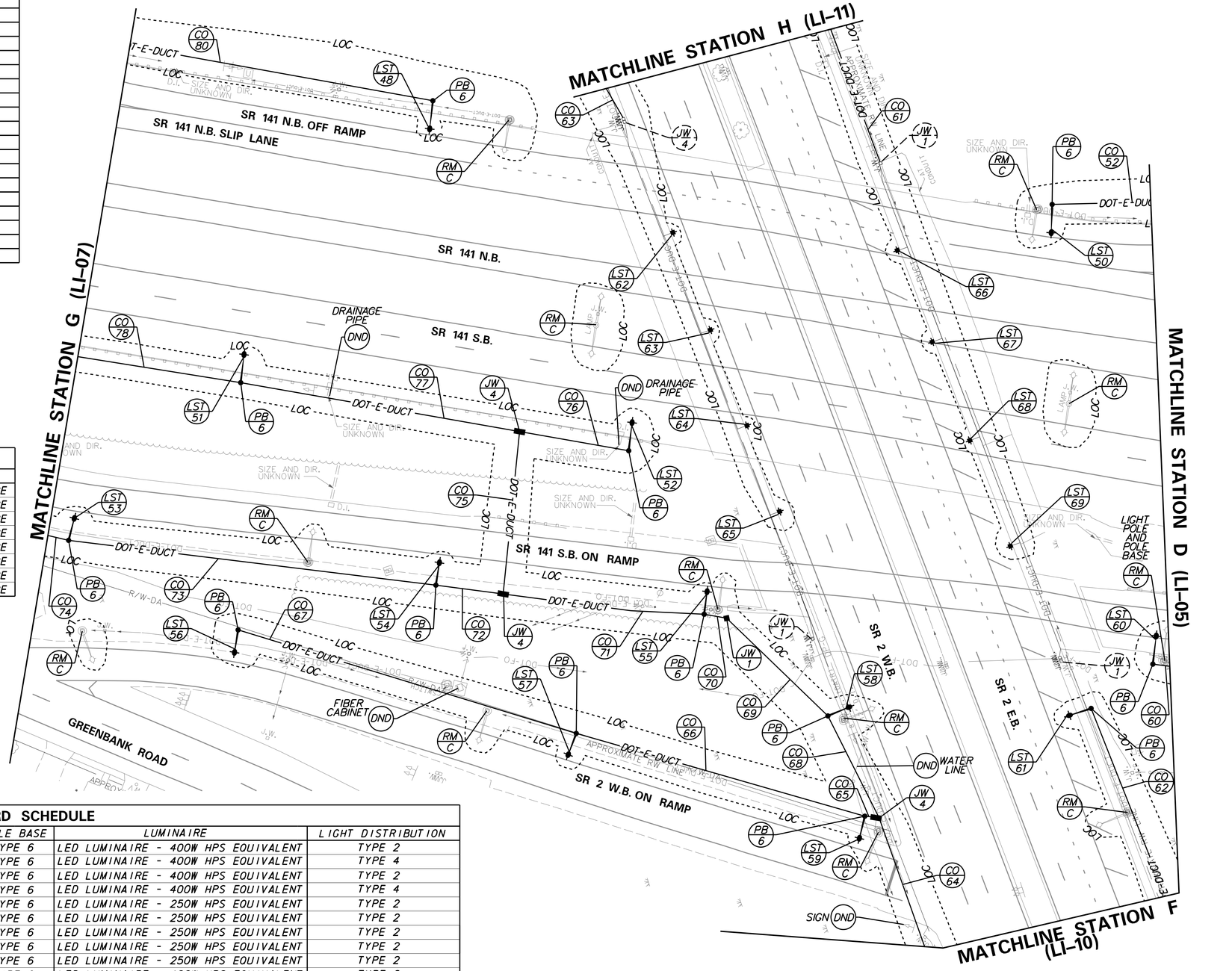
CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-52	INFORMATION SHOWN ON SHEET LI-05				
CO-60	INFORMATION SHOWN ON SHEET LI-05				
CO-61	1	3.0"	90'	T	(4) #6 + (1) #6 GND
CO-62	1	3.0"	145'	T	(2) #6 + (1) #6 GND
CO-63	1	3.0"	80'	T	(4) #6 + (1) #6 GND
CO-64	1 (SCH 80 HDPE)	4.0"	185'	B	(4) #6 + (1) #6 GND
CO-65	1	3.0"	10'	T	(4) #6 + (1) #6 GND
CO-66	1	3.0"	160'	T	(3) #6 + (1) #6 GND
CO-67	1	3.0"	190'	T	(2) #6 + (1) #6 GND
CO-68	1	3.0"	60'	T	(4) #6 + (1) #6 GND
CO-69	1	3.0"	75'	T	(4) #6 + (1) #6 GND
CO-70	1	3.0"	15'	T	(4) #6 + (1) #6 GND
CO-71	1	3.0"	110'	T	(4) #6 + (1) #6 GND
CO-72	1	3.0"	40'	T	(4) #6 + (1) #6 GND
CO-73	1	3.0"	200'	T	(3) #6 + (1) #6 GND
CO-74	1	3.0"	210'	T	(2) #6 + (1) #6 GND
CO-75	1 (SCH 80 HDPE)	4.0"	90'	B	(3) #6 + (1) #6 GND
CO-76	1	3.0"	60'	T	(2) #6 + (1) #6 GND
CO-77	1	3.0"	150'	T	(3) #6 + (1) #6 GND
CO-78	1	3.0"	185'	T	(2) #6 + (1) #6 GND
CO-80	1	3.0"	195'	T	(2) #6 + (1) #6 GND

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
B = BORE, T = TRENCH, O = OPEN CUT

UNDERBRIDGE LIGHTING SCHEDULE

NO.	CIRCUIT NO.	NORTHING	EASTING	LIGHT STANDARD	LUMINAIRE
62	A3	REPLACE EXISTING		UNDERBRIDGE MOUNTED	UNDERBRIDGE LED LUMINAIRE
63	A2	REPLACE EXISTING		UNDERBRIDGE MOUNTED	UNDERBRIDGE LED LUMINAIRE
64	A1	REPLACE EXISTING		UNDERBRIDGE MOUNTED	UNDERBRIDGE LED LUMINAIRE
65	A3	REPLACE EXISTING		UNDERBRIDGE MOUNTED	UNDERBRIDGE LED LUMINAIRE
66	A3	REPLACE EXISTING		UNDERBRIDGE MOUNTED	UNDERBRIDGE LED LUMINAIRE
67	A2	REPLACE EXISTING		UNDERBRIDGE MOUNTED	UNDERBRIDGE LED LUMINAIRE
68	A1	REPLACE EXISTING		UNDERBRIDGE MOUNTED	UNDERBRIDGE LED LUMINAIRE
69	A3	REPLACE EXISTING		UNDERBRIDGE MOUNTED	UNDERBRIDGE LED LUMINAIRE

NOTES:
1. REPLACE EXISTING UNDERBRIDGE LIGHTS, FROM LST #62 TO LST #69, WITH LED WALLPACKS.
2. INSTALL NEW CABLE UP TO UNDERBRIDGE LIGHTS IN EXISTING CONDUIT, IN ORDER TO CONNECT NEW LIGHTS TO THE NEW SYSTEM. THE EXISTING JUNCTION WELLS AND CONDUITS FOR THE UNDERBRIDGE LUMINAIRES SHOULD BE MAINTAINED AS IS.
3. THE EXISTING LIGHT POLES ALONG THE MEDIAN BETWEEN SR 141 NORTHBOUND AND SR 141 SOUTHBOUND SHOULD BE REMOVED. THE CONTRACTOR SHALL NOT DAMAGE THE MEDIAN DURING THE REMOVAL OF THE LIGHT POLES.
4. CONTRACTOR SHALL PLACE GROUNDING BUSHING AT THE WALLPACK LIGHTS UNDER SR 2.



W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	LIGHT DISTRIBUTION
48	A2	633122.4934	599252.5549	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
50	A2	632781.0808	599070.0361	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
51	B2	633219.3573	599112.4467	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
52	B1	633034.7801	599014.8551	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
53	B2	633331.8445	599060.9668	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
54	B1	633153.9526	598978.4847	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
55	B3	633023.4112	598920.0904	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
56	B1	633260.9667	598988.1609	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
57	B3	633107.3227	598880.8429	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
58	B2	632977.5868	598848.6062	12'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
59	B2	632975.3227	598792.0640	12'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
60	B1	632805.2705	598821.7636	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
61	B1	632843.6252	598809.4994	12'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2

ADDENDA / REVISIONS

SCALE 0 30 60 90 FEET

PRICES CORNER INTERCHANGE LIGHTING DESIGN

CONTRACT T201880206
COUNTY NEW CASTLE
BRIDGE NO. X
DESIGNED BY: KAB
CHECKED BY: MAW

LIGHTING PLAN

LI-06
SECTION JMT
SHEET NO. 10

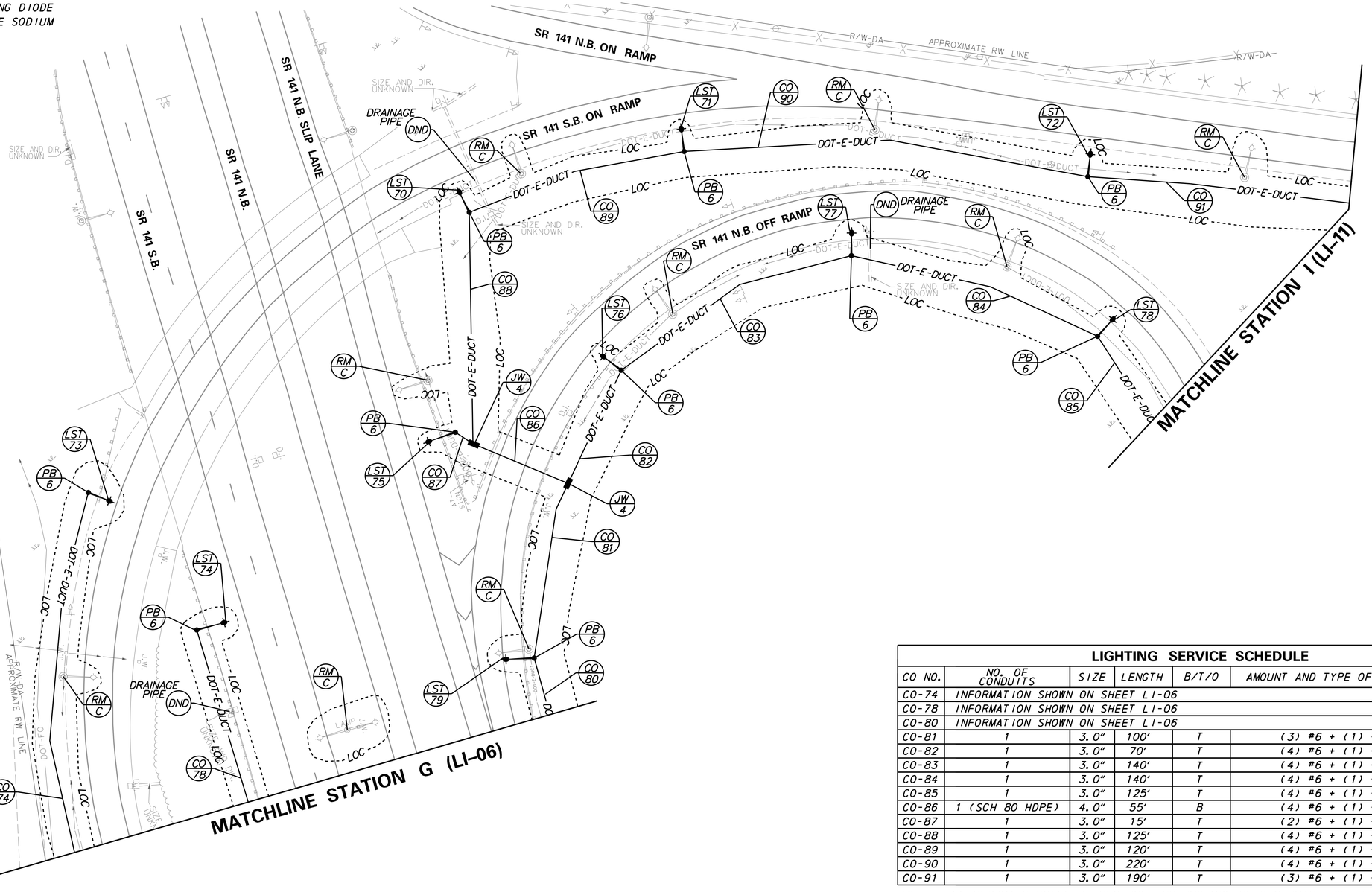
PLOTTED BY: KREHM DATE: 1/27/2020
FILE LOCATION: Q:\NDE\150151_000_TRAFFIC_ENGINEERING_\CADD\4-2_PRICES CORNER\LIDGN [SHEET: LI06]

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	LIGHT DISTRIBUTION
70	A2	633443.2498	599453.5266	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
71	A1	633387.9280	599558.5585	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
72	A3	633230.1360	599704.6963	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
73	B3	633475.1121	599204.1375	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
74	B3	633382.3786	599195.4522	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
75	A3	633363.7195	599367.5261	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
76	A1	633326.7447	599454.1356	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
77	A2	633286.4755	599584.7220	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
78	A3	633165.1533	599649.9072	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
79	A3	633247.8859	599315.0402	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2

W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM

NOTES
1. THE EXISTING LIGHT POLES ALONG THE MEDIAN BETWEEN SR 141 NORTHBOUND AND SR 141 SOUTHBOUND SHOULD BE REMOVED. THE CONTRACTOR SHALL NOT DAMAGE THE MEDIAN DURING THE REMOVAL OF THE LIGHT POLES.



LIGHTING SERVICE SCHEDULE

CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-74	INFORMATION SHOWN ON SHEET LI-06				
CO-78	INFORMATION SHOWN ON SHEET LI-06				
CO-80	INFORMATION SHOWN ON SHEET LI-06				
CO-81	1	3.0"	100'	T	(3) #6 + (1) #6 GND
CO-82	1	3.0"	70'	T	(4) #6 + (1) #6 GND
CO-83	1	3.0"	140'	T	(4) #6 + (1) #6 GND
CO-84	1	3.0"	140'	T	(4) #6 + (1) #6 GND
CO-85	1	3.0"	125'	T	(4) #6 + (1) #6 GND
CO-86	1 (SCH 80 HDPE)	4.0"	55'	B	(4) #6 + (1) #6 GND
CO-87	1	3.0"	15'	T	(2) #6 + (1) #6 GND
CO-88	1	3.0"	125'	T	(4) #6 + (1) #6 GND
CO-89	1	3.0"	120'	T	(4) #6 + (1) #6 GND
CO-90	1	3.0"	220'	T	(4) #6 + (1) #6 GND
CO-91	1	3.0"	190'	T	(3) #6 + (1) #6 GND

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
B = BORE, T = TRENCH, O = OPEN CUT

ADDENDA / REVISIONS

SCALE 0 30 60 90 FEET

PRICES CORNER INTERCHANGE
LIGHTING DESIGN

CONTRACT T201880206
COUNTY NEW CASTLE
BRIDGE NO. X
DESIGNED BY: KAB
CHECKED BY: MAW

LIGHTING PLAN

LI-07
SECTION JMT
SHEET NO. 11

PLOTTED BY: KREHM DATE: 1/27/2020
FILE LOCATION: Q:\NDE\150151_000_TRAFFIC_ENGINEERING_\CADD\4.2_PRICES_CORNER\LI.DGN [SHEET: LI07]

LIGHTING STANDARD SCHEDULE

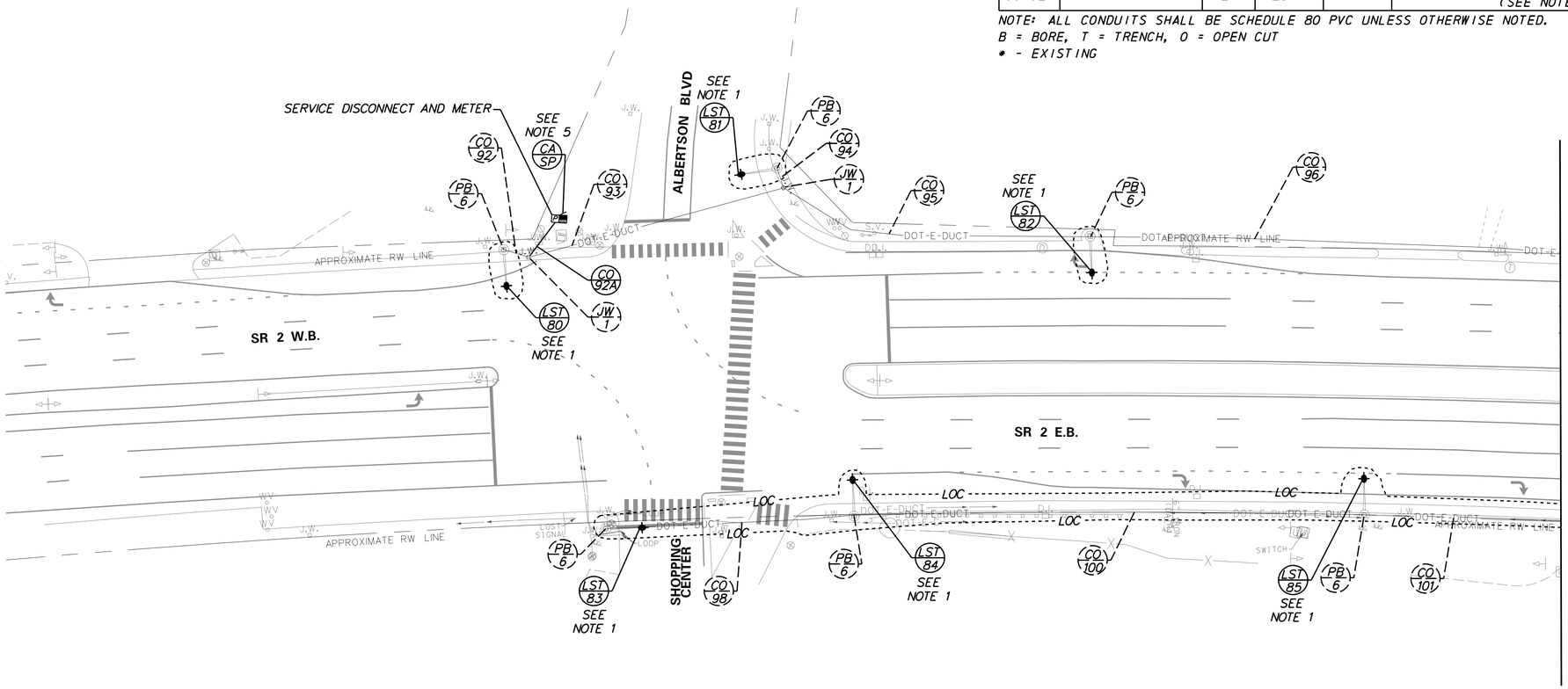
NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	LIGHT DISTRIBUTION
80	N/A	632740.5814	596947.9809	*12'	*30' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
81	N/A	632803.2186	597060.0784	*12'	*30' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
82	N/A	632803.9432	597204.4608	*12'	*30' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
83	B1	632627.8605	597020.2904	*12'	*30' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
84	B2	632657.8163	597128.2613	*12'	*30' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
85	B3	632708.4830	597352.2796	*12'	*30' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4

* = EXISTING
W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM

LIGHTING SERVICE SCHEDULE

CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
*CO-92	1	EX.	15'	-	EXISTING CABLES
*CO-93	1	EX.	120'	-	EXISTING CABLES
*CO-94	1	EX.	10'	-	EXISTING CABLES
*CO-95	1	EX.	145'	-	EXISTING CABLES
*CO-96	1	EX.	245'	-	EXISTING CABLES
*CO-98	1	EX.	95'	-	NEW [(2) #6 + (1) #6 GND]
*CO-100	1	EX.	230'	-	NEW [(3) #6 + (1) #6 GND]
*CO-101	1	EX.	245'	-	NEW [(4) #6 + (1) #6 GND]
CO-92A	1	2"	25'	T	NEW ELECTRICAL CABLE + (1)1/#6 GRD (SEE NOTE 6)

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
B = BORE, T = TRENCH, O = OPEN CUT
* - EXISTING



NOTES:
1. REPLACE EXISTING HPS LUMINAIRES WITH LED FIXTURES AS NOTED IN THE SCHEDULES.
2. DO NOT DISTRUB EXISTING CABLE DUCTS ALONG THE NORTH SIDE OF SR 2.
3. REMOVE THE EXISTING LIGHTING CABLES FROM THE CONDUITS ALONG THE SOUTH SIDE OF SR 2.
4. THE LIGHTS ALONG THE NORTH SIDE OF SR 2 ARE CONTROLLED VIA A SEPARATE LIGHTING SYSTEM. THEY WILL NOT BE CONNECTED TO THE PRICES CORNER LIGHTING SYSTEM. THE HPS LUMINAIRES SHALL BE REPLACED WITH LED LUMINAIRES TO ENSURE UNIFORM LIGHTING ALONG SR 2.
5. THE CONTRACTOR SHALL FIELD VERIFY THE LOCATION OF THE PROPOSED 60A LIGHTING CONTROL CABINET WITH SERVICE DISCONNECT LOCATION TO AVOID ANY UNDERGROUND UTILITY. SEE SHEET LI-15 FOR ADDITIONAL INFORMATION REGARDING THE 60A LIGHTING CABINET.
6. THE CONTRACTOR SHALL MATCH THE SIZE OF THE EXISTING ELECTRICAL CABLES AND CONNECT THEM FROM THE CABINET TO THE NEAREST JUNCTION WELL.

ADDENDA / REVISIONS

SCALE 0 30 60 90 FEET

PRICES CORNER INTERCHANGE
LIGHTING DESIGN

CONTRACT T201880206
COUNTY NEW CASTLE
BRIDGE NO. X
DESIGNED BY: KAB
CHECKED BY: MAW

LIGHTING PLAN

LI-08
SECTION JMT
SHEET NO. 12

LIGHTING STANDARD SCHEDULE

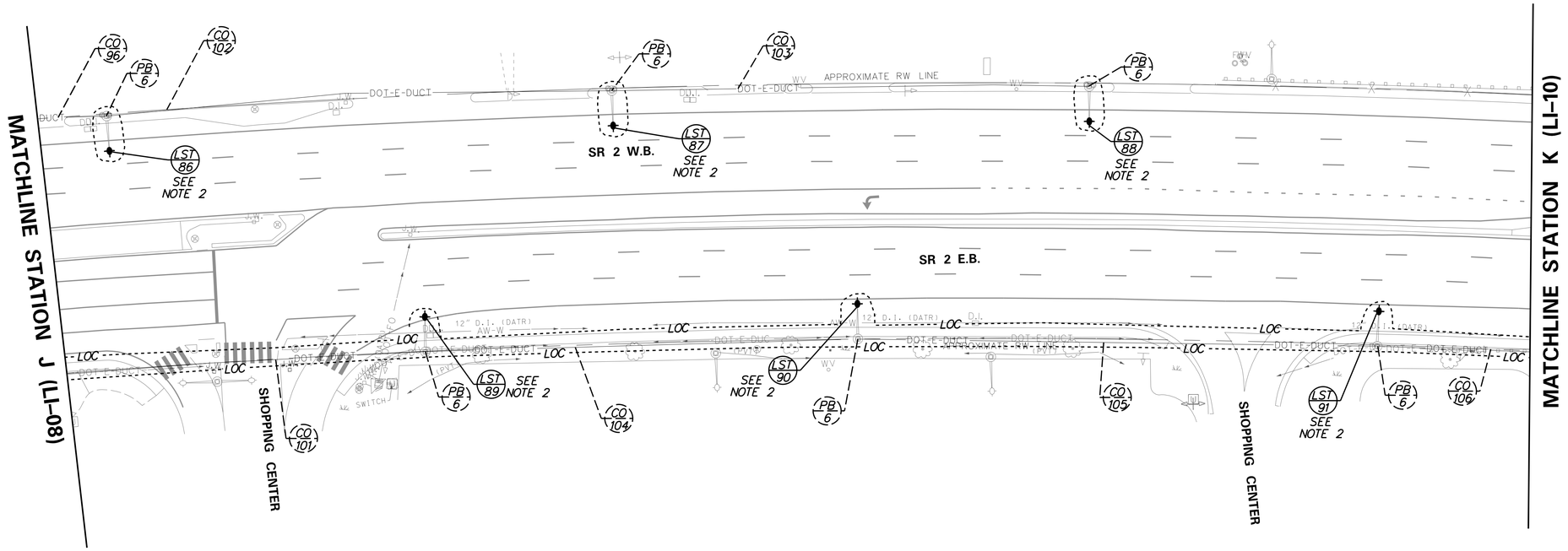
NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	LIGHT DISTRIBUTION
86	N/A	632847.4384	597444.5641	*12'	*30' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
87	N/A	632884.9247	597678.8812	*12'	*30' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
88	N/A	632911.1078	597901.2535	*12'	*30' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
89	B1	632753.5712	597605.2210	*12'	*30' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
90	B2	632781.6770	597806.2603	*12'	*30' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
91	B3	632804.6332	598048.7027	*12'	*30' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4

* = EXISITING
W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM

LIGHTING SERVICE SCHEDULE

CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
*CO-96	INFORMATION SHOWN ON LI-08				
*CO-101	INFORMATION SHOWN ON LI-08				
*CO-102	1	EX.	240'	-	EXISTING CABLES
*CO-103	1	EX.	225'	-	EXISTING CABLES
*CO-104	1	EX.	205'	-	NEW [(4) #6 + (1) #6 GND]
*CO-105	1	EX.	245'	-	NEW [(4) #6 + (1) #6 GND]
*CO-106	1	EX.	115'	-	NEW [(4) #6 + (1) #6 GND]

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 HDPE UNLESS OTHERWISE NOTED.
* - EXISTING
B = BORE, T = TRENCH, O = OPEN CUT



NOTES:
1. DO NOT DISTURB THE EXISTING CABLE DUCT ALONG THE NORTH SIDE OF SR 2.
2. REPLACE THE EXISTING HPS LUMINAIRES WITH LED FIXTURES AS NOTED IN THE SCHEDULES.
3. REMOVE THE EXISTING LIGHTING CABLES FROM THE CONDUITS ALONG THE SOUTH SIDE OF SR 2 AND INSTALL NEW CABLES AS SHOWN IN THE SCHEDULES.
4. THE LIGHTS ALONG THE NORTH SIDE OF SR 2 ARE CONTROLLED VIA A SEPARATE LIGHTING SYSTEM. THEY WILL NOT BE CONNECTED TO THE PRICES CORNER LIGHTING SYSTEM. THE HPS LUMINAIRES SHALL BE REPLACED WITH LED LUMINAIRES TO ENSURE UNIFORM LIGHTING ALONG SR 2.

ADDENDA / REVISIONS

SCALE 0 30 60 90 FEET

PRICES CORNER INTERCHANGE
LIGHTING DESIGN

CONTRACT T201880206
COUNTY NEW CASTLE
BRIDGE NO. X
DESIGNED BY: KAB
CHECKED BY: MAW

LIGHTING PLAN

LI-09
SECTION JMT
SHEET NO. 13

UNDERBRIDGE LIGHTING SCHEDULE

NO.	CIRCUIT NO.	NORTHING	EASTING	LIGHT STANDARD	LUMINAIRE
*100	B1	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*101	B2	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*102	B3	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*103	B1	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*104	B2	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*105	B3	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*106	B1	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*107	B2	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*108	B3	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*109	B1	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*110	B2	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE
*111	B3	MAINTAIN EXISTING		*UNDERBIRDGE MOUNTED	*UNDERBRIDGE LED LUMINAIRE

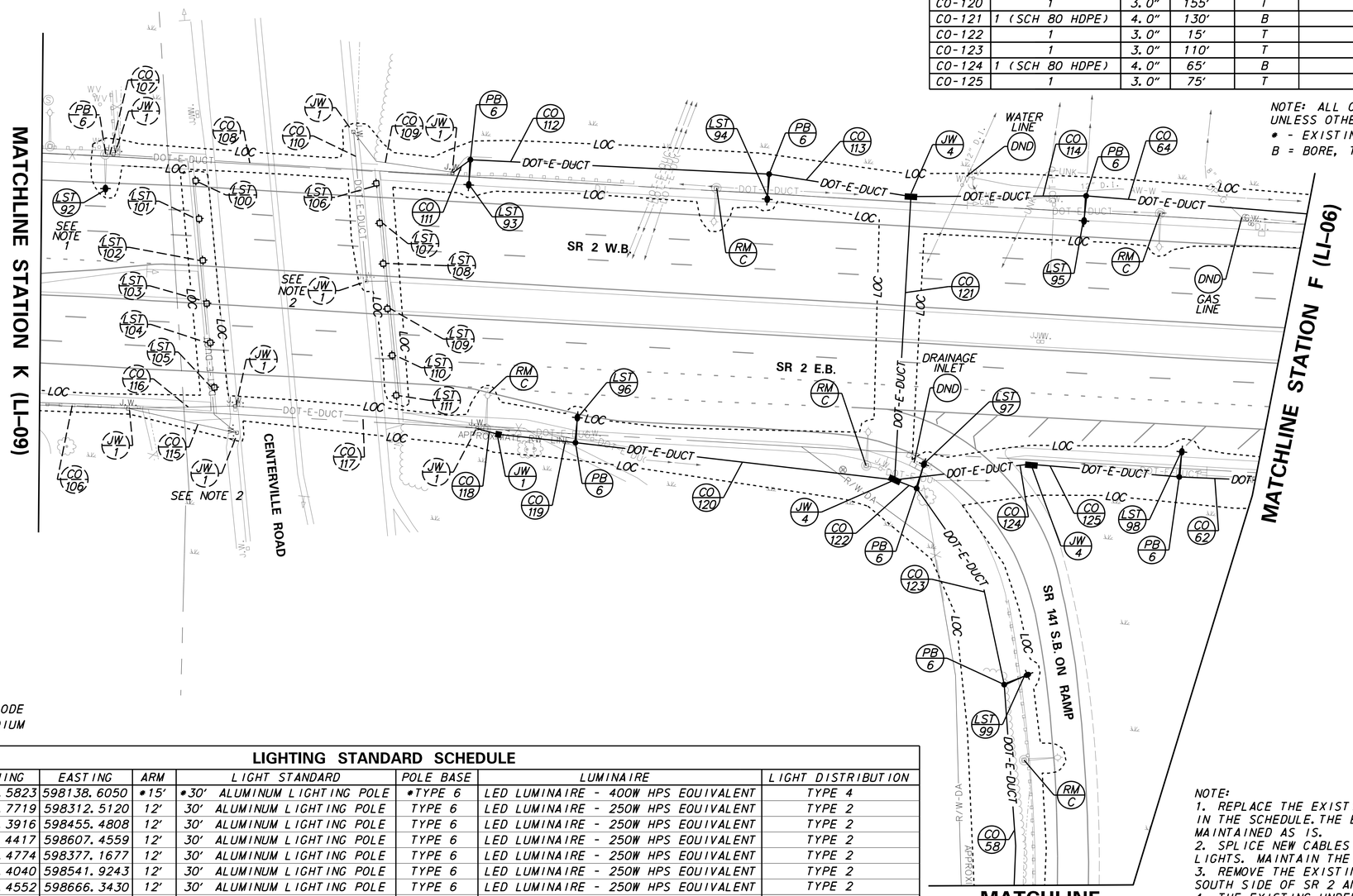
* - EXISTING

NOTE: DO NOT DISTURB THE EXISTING UNDERBRIDGE LIGHTS

LIGHTING SERVICE SCHEDULE

CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-58	INFORMATION SHOWN ON LI-05				
CO-62	INFORMATION SHOWN ON LI-06				
CO-64	INFORMATION SHOWN ON LI-06				
*CO-106	INFORMATION SHOWN ON LI-09				
*CO-107	1	EX.	5'	-	NEW [(2) #6 + (1) #6 GND]
*CO-108	1	EX.	225'	-	NEW [(2) #6 + (1) #6 GND]
*CO-109	1	EX.	205'	-	NEW [(4) #6 + (1) #6 GND]
*CO-110	1	EX.	245'	-	NEW [(4) #6 + (1) #6 GND]
CO-111	1	3.0"	15'	T	(4) #6 + (1) #6 GND
CO-112	1	3.0"	145'	T	(4) #6 + (1) #6 GND
CO-113	1	3.0"	70'	T	(4) #6 + (1) #6 GND
CO-114	1	3.0"	85'	T	(4) #6 + (1) #6 GND
*CO-115	1	EX.	55'	-	NEW [(4) #6 + (1) #6 GND]
*CO-116	1	EX.	55'	-	NEW [(4) #6 + (1) #6 GND]
*CO-117	1	EX.	120'	-	NEW [(4) #6 + (1) #6 GND]
CO-118	1	4.0"	15'	T	(4) #6 + (1) #6 GND
CO-119	1	3.0"	40'	T	(4) #6 + (1) #6 GND
CO-120	1	3.0"	155'	T	(4) #6 + (1) #6 GND
CO-121	1 (SCH 80 HDPE)	4.0"	130'	B	(4) #6 + (1) #6 GND
CO-122	1	3.0"	15'	T	(4) #6 + (1) #6 GND
CO-123	1	3.0"	110'	T	(4) #6 + (1) #6 GND
CO-124	1 (SCH 80 HDPE)	4.0"	65'	B	(3) #6 + (1) #6 GND
CO-125	1	3.0"	75'	T	(3) #6 + (1) #6 GND

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
* - EXISTING
B = BORE, T = TRENCH, O = OPEN CUT



* = EXISTING
W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	LIGHT DISTRIBUTION
92	B1	632932.5823	598138.6050	*15'	*30' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 4
93	B2	632948.7719	598312.5120	12'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
94	B3	632957.3916	598455.4808	12'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
95	B1	632963.4417	598607.4559	12'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
96	B1	632819.4774	598377.1677	12'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
97	B3	632815.4040	598541.9243	12'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
98	B2	632834.4552	598666.3430	12'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
99	B1	632726.4907	598593.7630	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2

NOTE:
1. REPLACE THE EXISTING HPS LUMINAIRE WITH AN LED FIXTURE AS NOTED IN THE SCHEDULE. THE EXISTING LIGHT POLE AND POLE BASE SHALL BE MAINTAINED AS IS.
2. SPLICE NEW CABLES TO THE EXISTING CABLES POWERING THE UNDERBRIDGE LIGHTS. MAINTAIN THE EXISTING CONDUITS.
3. REMOVE THE EXISTING LIGHTING CABLES FROM THE CONDUITS ALONG THE SOUTH SIDE OF SR 2 AND INSTALL NEW CABLES AS SHOWN IN THE SCHEDULES.
4. THE EXISTING UNDERBRIDGE LUMINAIRES, LST #100 - #111, ARE 33 WATTS AND SHALL BE MAINTAINED AS IS.

MATCHLINE STATION F (LI-05)

LI-10

ADDENDA / REVISIONS

SCALE 0 30 60 90 FEET

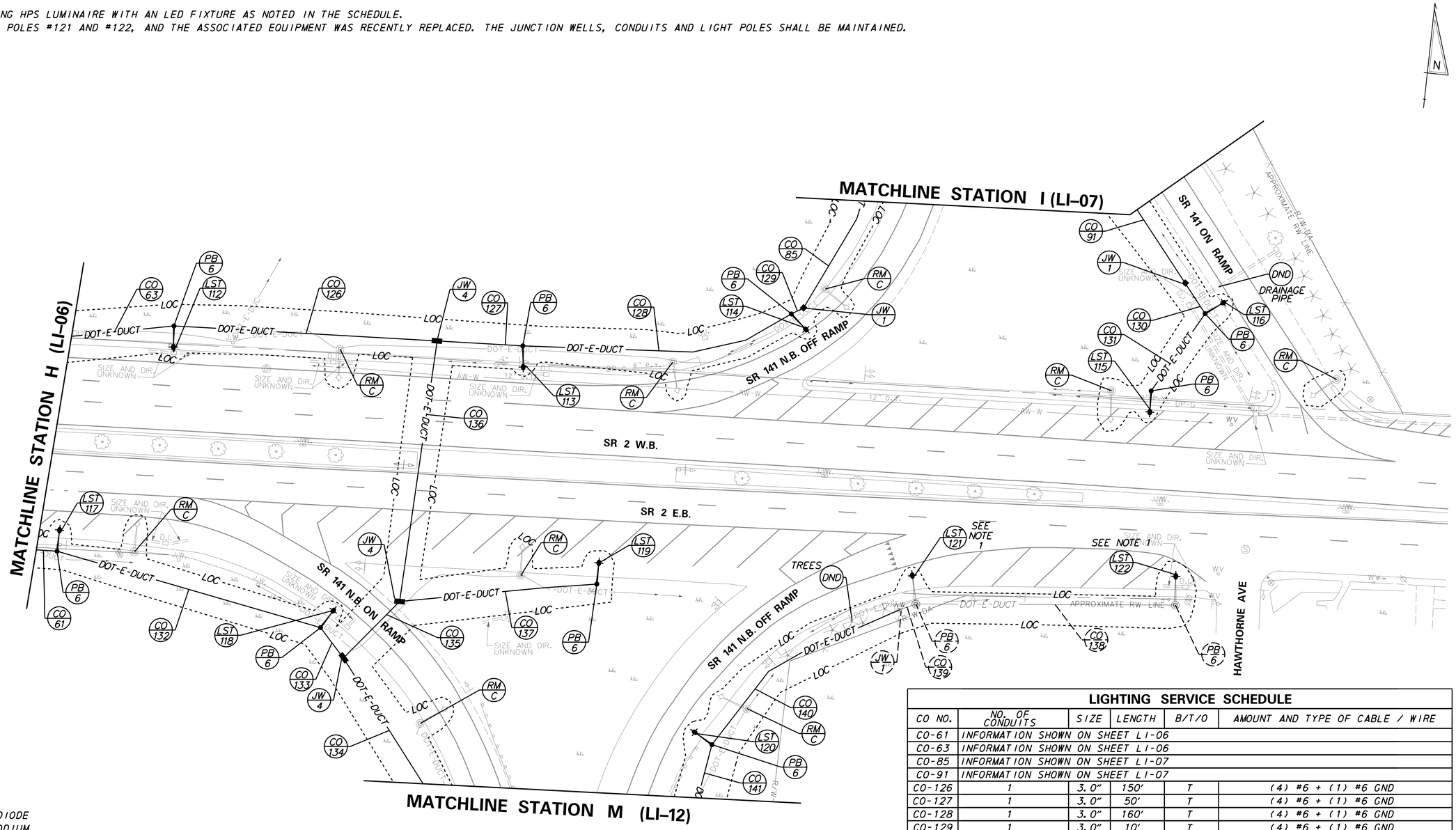
PRICES CORNER INTERCHANGE
LIGHTING DESIGN

CONTRACT T201880206
COUNTY NEW CASTLE
BRIDGE NO. X
DESIGNED BY: KAB
CHECKED BY: MAW

LIGHTING PLAN

SECTION JMT
SHEET NO. 14

NOTES:
1. REPLACE THE EXISTING HPS LUMINAIRE WITH AN LED FIXTURE AS NOTED IN THE SCHEDULE.
2. THE EXISTING LIGHT POLES #121 AND #122, AND THE ASSOCIATED EQUIPMENT WAS RECENTLY REPLACED. THE JUNCTION WELLS, CONDUITS AND LIGHT POLES SHALL BE MAINTAINED.



* = EXISTING
W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	LIGHT DISTRIBUTION
112	A1	632999.2531	599258.3355	12'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
113	A2	633009.4378	599456.8245	12'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
114	A1	633043.9994	599606.6281	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
115	A1	633022.5980	599814.7917	12'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
116	A2	633069.5732	599840.5268	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
117	A1	632864.7079	599206.1492	12'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
118	A2	632837.7163	599359.7685	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
119	A2	632879.3266	599513.2840	12'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
120	A3	632795.6507	599588.2134	12'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
121	A2	632887.6855	599694.9094	*12'	*30' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
122	A1	632902.9816	599841.7154	*12'	*30' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2

LIGHTING SERVICE SCHEDULE

CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-61	INFORMATION SHOWN ON SHEET LI-06				
CO-63	INFORMATION SHOWN ON SHEET LI-06				
CO-85	INFORMATION SHOWN ON SHEET LI-07				
CO-91	INFORMATION SHOWN ON SHEET LI-07				
CO-126	1	3.0"	150'	T	(4) #6 + (1) #6 GND
CO-127	1	3.0"	50'	T	(4) #6 + (1) #6 GND
CO-128	1	3.0"	160'	T	(4) #6 + (1) #6 GND
CO-129	1	3.0"	10'	T	(4) #6 + (1) #6 GND
CO-130	1	3.0"	20'	T	(3) #6 + (1) #6 GND
CO-131	1	3.0"	55'	T	(2) #6 + (1) #6 GND
CO-132	1	3.0"	160'	T	(4) #6 + (1) #6 GND
CO-133	1	3.0"	25'	T	(4) #6 + (1) #6 GND
CO-134	1	3.0"	135'	T	(4) #6 + (1) #6 GND
CO-135	1 (SCH 80 HDPE)	4.0"	45'	B	(4) #6 + (1) #6 GND
CO-136	1 (SCH 80 HDPE)	4.0"	150'	B	(4) #6 + (1) #6 GND
CO-137	1	3.0"	115'	T	(2) #6 + (1) #6 GND
*CO-138	1	EX.	150'	-	NEW [(2) #6 + (1) #6 GND]
*CO-139	1	EX.	10'	-	NEW [(3) #6 + (1) #6 GND]
CO-140	1	3.0"	135'	T	(3) #6 + (1) #6 GND
CO-141	1	3.0"	190'	T	(4) #6 + (1) #6 GND

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
* - EXISTING
B = BORE, T = TRENCH, O = OPEN CUT

ADDENDA / REVISIONS

SCALE
0 30 60 90
FEET

PRICES CORNER INTERCHANGE
LIGHTING DESIGN

CONTRACT T201880206
COUNTY NEW CASTLE
BRIDGE NO. X
DESIGNED BY: KAB
CHECKED BY: MAW

LIGHTING PLAN

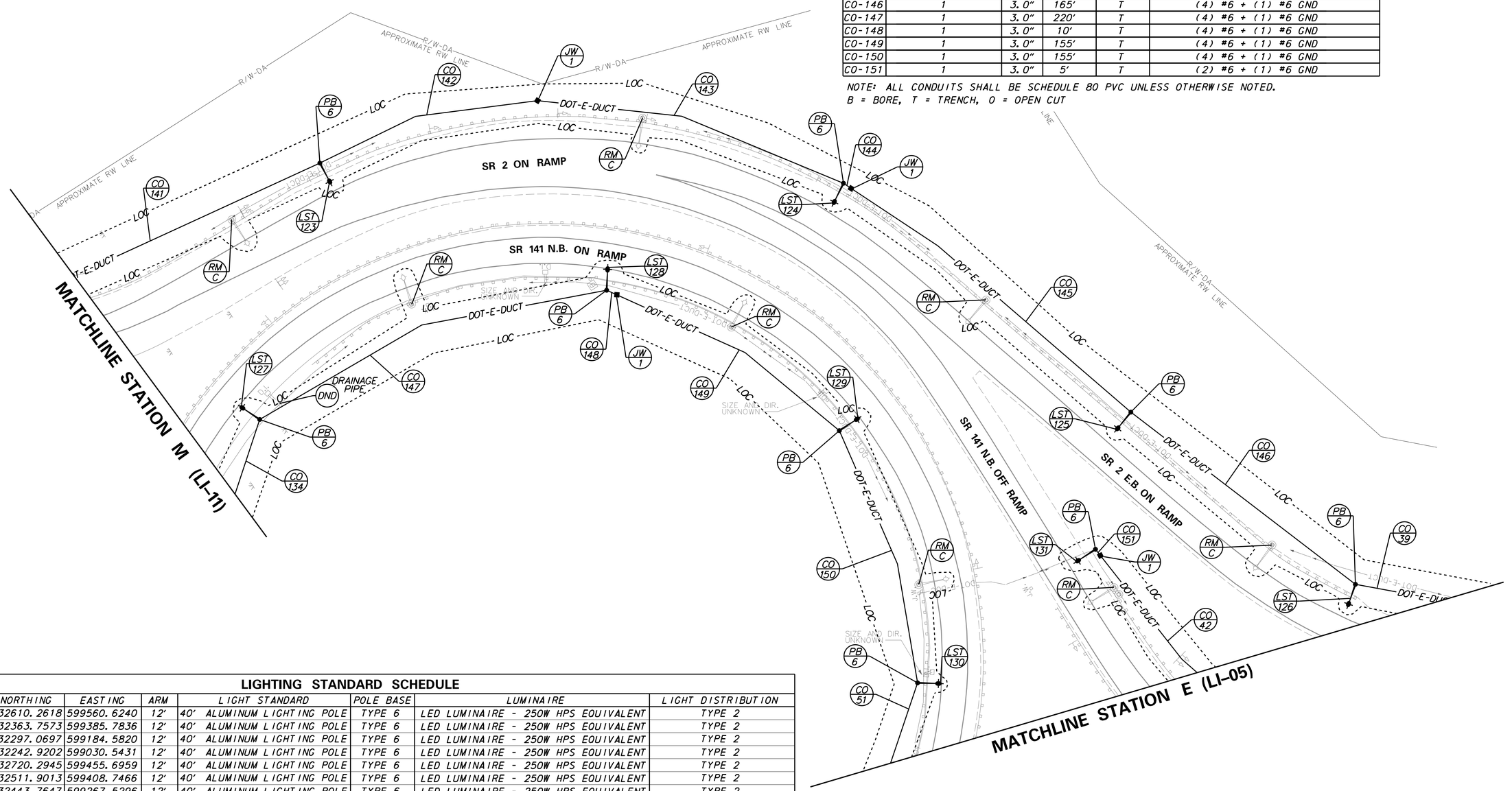
LI-11
SECTION JMT
SHEET NO. 15

PLOTTED BY: KREHM DATE: 1/27/2020
FILE LOCATION: Q:\NDE\150151_000_TRAFFIC_ENGINEERING_\CADD\4.2_PRICES CORNER\LI.DGN [SHEET: LI11]

LIGHTING SERVICE SCHEDULE

CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-39	INFORMATION SHOWN ON SHEET LI-05				
CO-42	INFORMATION SHOWN ON SHEET LI-05				
CO-51	INFORMATION SHOWN ON SHEET LI-05				
CO-134	INFORMATION SHOWN ON SHEET LI-11				
CO-141	INFORMATION SHOWN ON SHEET LI-11				
CO-142	1	3.0"	135'	T	(4) #6 + (1) #6 GND
CO-143	1	3.0"	185'	T	(4) #6 + (1) #6 GND
CO-144	1	3.0"	5'	T	(4) #6 + (1) #6 GND
CO-145	1	3.0"	210'	T	(4) #6 + (1) #6 GND
CO-146	1	3.0"	165'	T	(4) #6 + (1) #6 GND
CO-147	1	3.0"	220'	T	(4) #6 + (1) #6 GND
CO-148	1	3.0"	10'	T	(4) #6 + (1) #6 GND
CO-149	1	3.0"	155'	T	(4) #6 + (1) #6 GND
CO-150	1	3.0"	155'	T	(4) #6 + (1) #6 GND
CO-151	1	3.0"	5'	T	(2) #6 + (1) #6 GND

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
B = BORE, T = TRENCH, O = OPEN CUT



LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	LIGHT DISTRIBUTION
123	A1	632610.2618	599560.6240	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
124	A2	632363.7573	599385.7836	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
125	A3	632297.0697	599184.5820	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
126	A1	632242.9202	599030.5431	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
127	A3	632720.2945	599455.6959	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
128	A1	632511.9013	599408.7466	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
129	A2	632443.7647	599267.5296	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
130	A3	632485.5307	599120.9665	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2
131	A1	632357.4515	599129.4219	12'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT	TYPE 2

W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM

ADDENDA / REVISIONS

SCALE 0 30 60 90 FEET

PRICES CORNER INTERCHANGE
LIGHTING DESIGN

CONTRACT T201880206
COUNTY NEW CASTLE
BRIDGE NO. X
DESIGNED BY: KAB
CHECKED BY: MAW

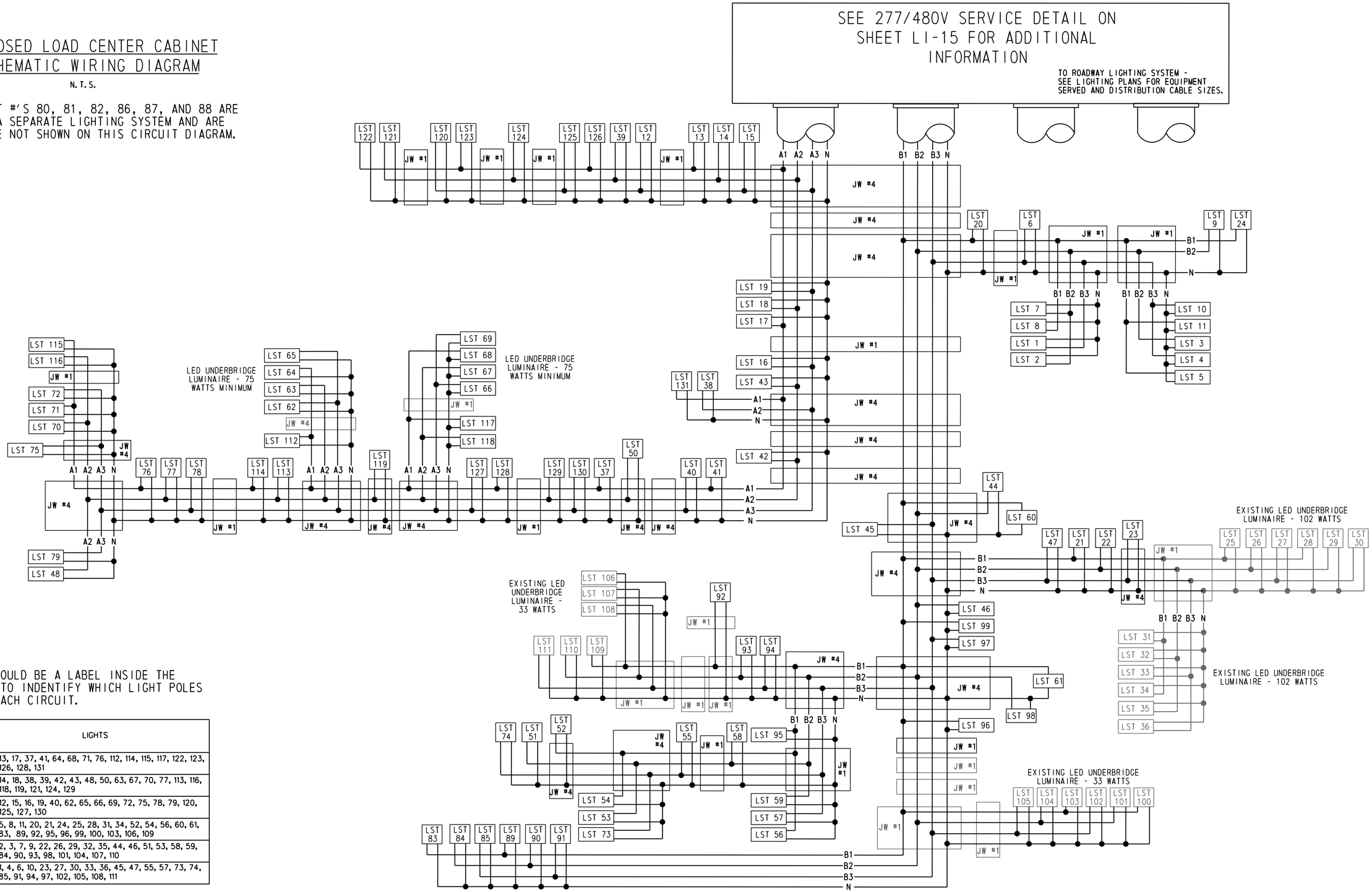
LIGHTING PLAN

LI-12
SECTION JMT
SHEET NO. 16

PROPOSED LOAD CENTER CABINET SCHEMATIC WIRING DIAGRAM

N.T.S.

NOTE: LST #'S 80, 81, 82, 86, 87, AND 88 ARE PART OF A SEPARATE LIGHTING SYSTEM AND ARE THEREFORE NOT SHOWN ON THIS CIRCUIT DIAGRAM.



THERE SHOULD BE A LABEL INSIDE THE CABINET TO INDENTIFY WHICH LIGHT POLES ARE ON EACH CIRCUIT.

CIRCUIT	LIGHTS
A1	13, 17, 37, 41, 64, 68, 71, 76, 112, 114, 115, 117, 122, 123, 126, 128, 131
A2	14, 18, 38, 39, 42, 43, 48, 50, 63, 67, 70, 77, 113, 116, 118, 119, 121, 124, 129
A3	12, 15, 16, 19, 40, 62, 65, 66, 69, 72, 75, 78, 79, 120, 125, 127, 130
B1	5, 8, 11, 20, 21, 24, 25, 28, 31, 34, 52, 54, 56, 60, 61, 83, 89, 92, 95, 96, 99, 100, 103, 106, 109
B2	2, 3, 7, 9, 22, 26, 29, 32, 35, 44, 46, 51, 53, 58, 59, 84, 90, 93, 98, 101, 104, 107, 110
B3	1, 4, 6, 10, 23, 27, 30, 33, 36, 45, 47, 55, 57, 73, 74, 85, 91, 94, 97, 102, 105, 108, 111

PLOTTED BY: KREHM DATE: 1/27/2020
FILE LOCATION: Q:\NDE\150151_000_TRAFFIC_ENGINEERING_\CADD\4.2_PRICES CORNER\LI.DGN [SHEET: LI13]

ADDENDA / REVISIONS	NOT TO SCALE	PRICES CORNER INTERCHANGE LIGHTING DESIGN	CONTRACT T201880206	BRIDGE NO. X	LIGHTING DETAILS	LI-13
			COUNTY NEW CASTLE	DESIGNED BY: KAB		SECTION JMT
				CHECKED BY: MAW		SHEET NO. 17

GENERAL NOTES

1. ALL ELECTRICAL WORK SHALL BE PERFORMED AND ALL MATERIAL PROVIDED SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE OF THE NATIONAL FIRE PROTECTION ASSOCIATION, TO ALL LOCAL AND SPECIAL LAWS, AND/OR TO ORDINANCES GOVERNING SUCH MATERIAL. CODE SHALL BE CONSIDERED THE MINIMUM REQUIREMENTS FOR THE ELECTRICAL WORK AND IF THERE IS A CONFLICT BETWEEN THE REQUIREMENTS SPECIFIED IN THE CONTRACT DOCUMENTS AND THE CODE, THE MORE STRINGENT REQUIREMENT WILL APPLY AS DETERMINED AND APPROVED BY THE ENGINEER. WHEN THESE REQUIREMENTS DO NOT GOVERN, AND WHERE NOT OTHERWISE SPECIFIED, ELECTRICAL MATERIALS SHALL CONFORM TO THE STANDARDIZATION RULES OF THE INSTITUTE OF ELECTRICAL ENGINEERS.

2. CONDUIT RUNS ARE SHOWN IN APPROXIMATE LOCATIONS. THE CONTRACTOR SHALL LOCATE THE CONDUIT RUNS IN A MANNER THAT AVOIDS CONFLICTS WITH ALL EXISTING AND PROPOSED FEATURES AS APPROVED BY THE ENGINEER.

3. THE CONTRACTOR SHALL PROVIDE AND SECURE ALL ELECTRICAL INSPECTIONS AS REQUIRED AND PAY FOR THE SAME.

4. THE ELECTRICAL CONTRACTOR SHALL GUARANTEE ALL WORK MATERIAL AND LABOR TO BE FREE FROM DEFECTS FOR A ONE YEAR PERIOD FROM THE TIME OF DELDOT ACCEPTANCE. ANY DEFECTS OCCURING DURING THIS PERIOD SHALL BE CORRECTED BY THE ELECTRICAL CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER. ADDITIONALLY, THE CONTRACTOR SHALL SUBMIT AN AS-BUILT PLAN TO THE NORTH DISTRICT TO KEEP ON FILE.

5. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AT SITE PRIOR TO WORK.

6. WORK INCLUDES FURNISHING LABOR, MATERIAL, EQUIPMENT AND SERVICE NECESSARY AND INCIDENTAL TO PROPER COMPLETION OF THE ELECTRICAL WORK AS SHOWN. MINOR ITEMS, ACCESSORIES OR DEVICES NECESSARY FOR COMPLETION AND PROPER OPERATION OF ANY SYSTEM SHALL BE PROVIDED WHETHER OR NOT THEY ARE SPECIFICALLY CALLED FOR BY SPECIFICATIONS OR DRAWINGS.

7. THE ELECTRICAL CONTRACTOR SHALL COORDINATE HIS WORK WITH ALL THE CONTRACTORS INVOLVED ON THIS PROJECT. THE ELECTRICAL CONTRACTOR SHALL COORDINATE WITH THE ENGINEER AND THE GENERAL SUPERINTENDENT FOR THE LOCATIONS OF ALL CONDUIT AND POLE BASES TO ELIMINATE CONSTRUCTION CONFLICTS.

8. THE ELECTRICAL CONTRACTOR SHALL OBTAIN, AT HIS EXPENSE, ALL NECESSARY PERMITS AND CERTIFICATES AS REQUIRED.

9. TERMINATE ALL CONDUITS WHEN ENTERING ENCLOSURES WITH LOCKNUT AND BONDING BUSHINGS. ALL OTHER CONDUITS SHALL BE PROVIDED WITH BONDING BUSHINGS. ALL CONDUITS SHALL BE BONDED WITH THE GROUND WIRE.

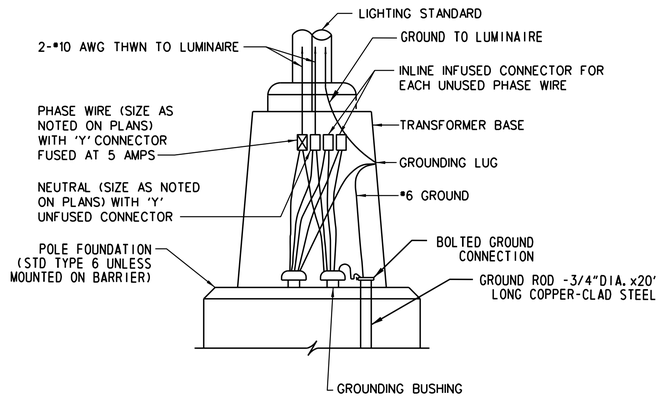
10. COLOR CODING SHALL BE PROVIDED THROUGHOUT THE ENTIRE NETWORK FOR SERVICE, FEEDER, BRANCH AND CONTROL CONDUCTORS. EACH PHASE SHALL BE AN INDEPENDENT COLOR. CONDUCTORS SHALL HAVE FACTORY IMPREGNATED COLOR THROUGHOUT THEIR ENTIRE LENGTH. PHASE TAPING IS NOT PERMITTED.

11. THE CONTRACTOR SHALL NOTIFY DELMARVA POWER TWO WEEKS IN ADVANCE TO ARRANGE FINAL POWER CONNECTIONS. CONTACT: MR. ANGEL M. COLLAZO 302-454-4370 OR MR. TOM SMITH 302-283-5757.

12. ALL FUSED CONNECTIONS SHALL BE MADE IN THE POLE BASE, UNLESS OTHERWISE NOTED. SPLICES IN JUNCTION BOXES OR PULL BOXES SHALL NOT BE FUSED EXCEPT AT NEMA 4X BOXES, IF NEEDED.

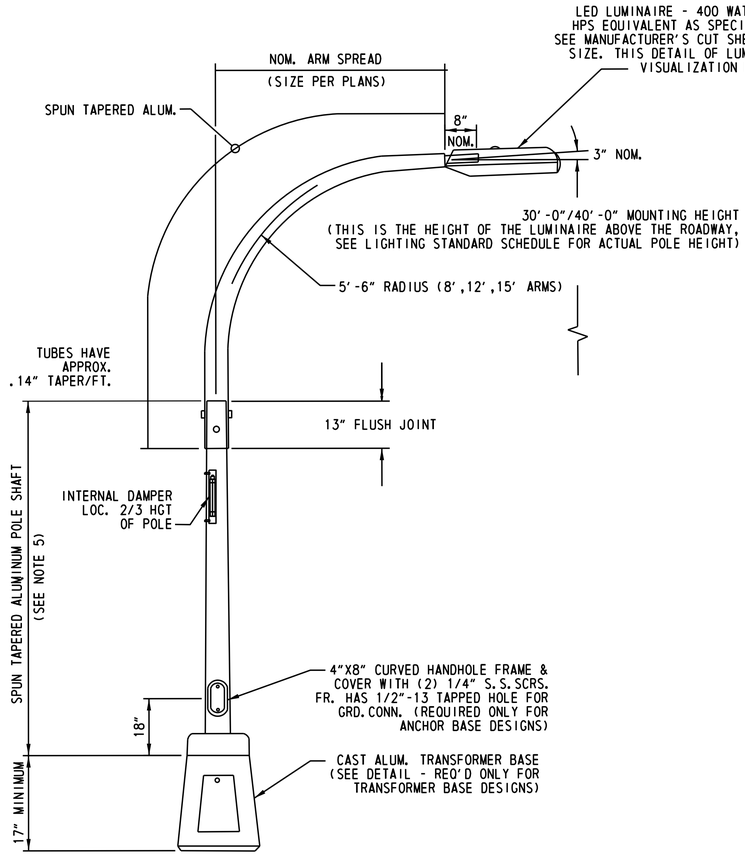
13. USE CAUTION WHEN INSTALLING CONDUITS UNDER EXISTING CULVERTS.

14. ALL COSTS ASSOCIATED WITH CONNECTING PROPOSED CONDUIT TO EXISTING JUNCTION WELLS OR EXISTING CONDUITS SHALL BE CONSIDERED INCIDENTAL TO THE COST OF THE CONDUIT BEING INSTALLED.



TYPICAL LUMINAIRE CONNECTION - 277/480V SERVICE

N. T. S.

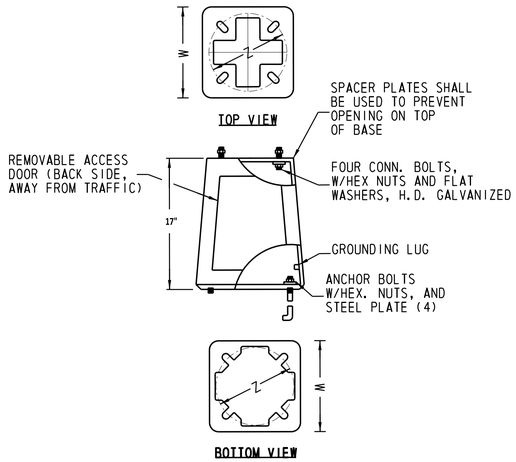


DAVIT ARM LIGHT POLE DETAIL

N. T. S.

NOTES:
1. HEAT TREAT POLE & DAVIT TO -T6, TEMPER AFTER WELDING.
2. FINISH - POLE & DAVIT SHALL BE SATIN FINISHED POLISHED AND WRAPPED.
3. DESIGNED IN ACCORDANCE WITH STANDARDS ESTABLISHED BY THE LATEST EDITION OF AASHTO REQUIREMENTS.
4. TRANSFORMER SHALL MEET THE STANDARDS ESTABLISHED BY THE LATEST EDITION OF AASHTO BREAKAWAY REQUIREMENTS.
5. DUE TO VARYING ELEVATIONS OF ROADWAY, IT MAY BE NECESSARY TO MAINTAIN A NOMINAL FIXTURE MOUNTING HEIGHT (OF 30' OR 40', AS SPECIFIED ON PLANS) ABOVE THE ROADWAY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THESE MEASUREMENTS. BETWEEN TWO ADJACENT LUMINAIRES, THE DIFFERENCE IN HEIGHT SHALL NOT EXCEED 12".

MATERIAL SPECIFICATION	
POLE & DAVIT TUBES	6063-T6
ANCHOR BASE	AA356-T6
BOLT COVERS	AA356
ANCHOR BOLT NUTS	ASTM-A563 GR. A
ANCHOR BOLTS	ASTM-F1554 GR55
STN. STL. HARDWARE	AISI-300 SERIES STN. STL.
TRANSFORMER BASE	AA356-T6
T-BASE HARDWARE	ASTM-A325 GALV.



LIGHTING STRUCTURE ON BREAKAWAY TRANSFORMER BASE

N. T. S.

MOUNTING HEIGHT	ARM LENGTH	MIN WIDTH 'W'	BOLT DIA.	BOLT CIRCLE 'Z'
LESS THAN 40'	LESS THAN 30'	13"	1"	13 ½"
40'	LESS THAN OR EQUAL TO 20'	13"	1"	13 ½"

NOTES:
1. ALUMINUM TRANSFORMER BASE SHALL MEET THE MOST RECENT AASHTO BREAKAWAY REQUIREMENTS

2. BREAKAWAY TRANSFORMER BASES SHALL BE INSTALLED WITH ALL POLES, UNLESS OTHERWISE NOTED.

3. OPENING OF TRANSFORMER BASE ACCESS DOOR SHALL BE INSTALLED ON THE SIDE OF THE POLE FACING AWAY FROM TRAFFIC.

4. PROVIDE ACCESSIBLE GROUNDING NUT OR LUG INSIDE TRANSFORMER BASE.

5. PROVIDE WASHERS, SHIMS AND BOLTS AS REQUIRED BY TRANSFORMER BASE MANUFACTURER.

6. THE CONTACT AREA BETWEEN THE TRANSFORMER BASE AND CONCRETE FOUNDATION SHALL BE SHOP COATED WITH COAL TAR EPOXY MEETING SSPC-PAINT 16 SPECIFICATIONS. THE THICKNESS OF THE COATING SHALL BE BETWEEN 6 AND 8 MILS. THE COATING SHALL BE COMPLETELY DRY BEFORE INSTALLATION. THE TOP OF THE FOUNDATION SHALL NOT BE PAINTED.

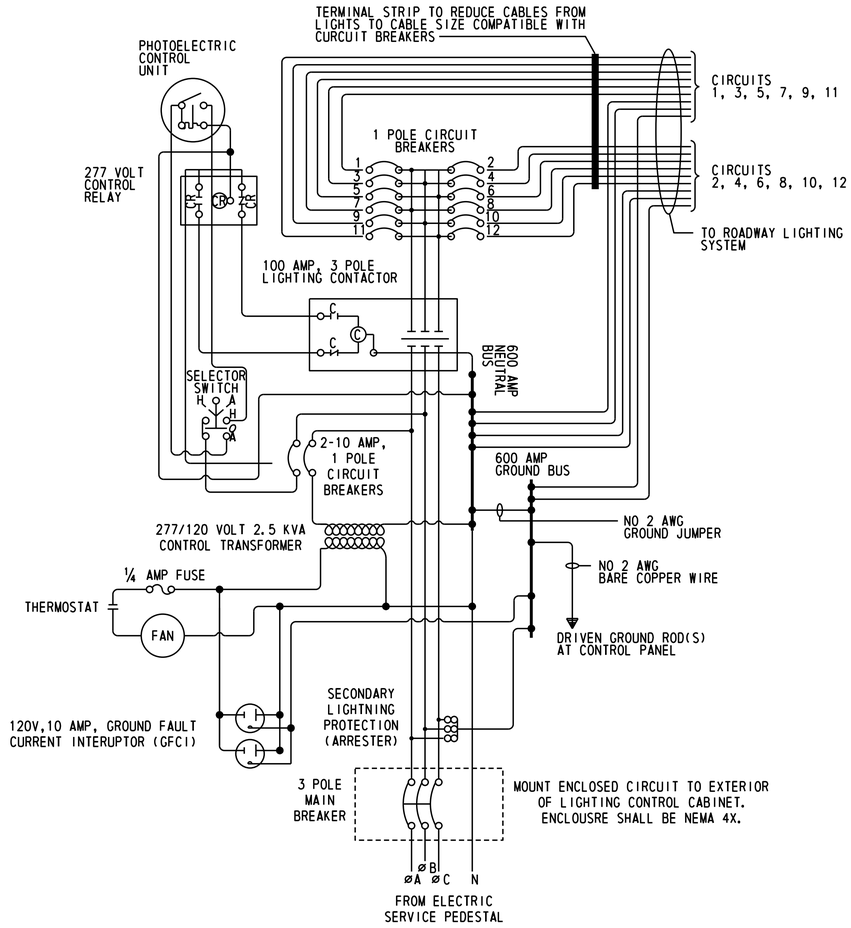
7. TOP AND BOTTOM OF BASE MAY BE SLOTTED FOR BOLT CIRCLE. SLOT MUST ACCOMMODATE DIMENSION SHOWN.

8. TRANSFORMER BASE AND ASSOCIATED COMPONENTS SHALL MEET THE FOLLOWING MATERIAL REQUIREMENTS:

MATERIAL SPECIFICATION	
POLE & DAVIT TUBES	6063-T6
ANCHOR BASE	AA356-T6
BOLT COVERS	AA356
ANCHOR BOLT NUTS	ASTM-A563 GR. A
ANCHOR BOLTS	ASTM-F1554 GR55
STN. STL. HARDWARE	AISI-300 SERIES SST
TRANSFORMER BASE	AA356-T6
T-BASE HARDWARE	ASTM-A325 GALV.

ADDENDA / REVISIONS		NOT TO SCALE	PRICES CORNER INTERCHANGE LIGHTING DESIGN	CONTRACT T201880206	BRIDGE NO. X	LIGHTING DETAIL	LI-14
				COUNTY NEW CASTLE	DESIGNED BY: KAB		SECTION JMT
					CHECKED BY: MAW		SHEET NO. 18

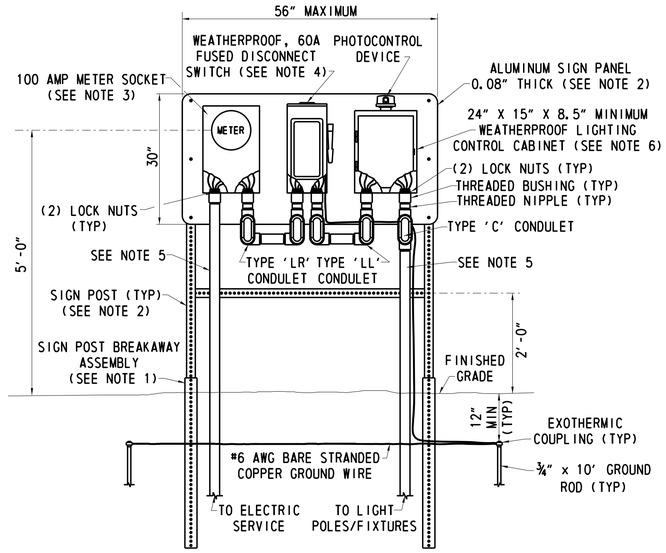
LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE WIRING DIAGRAM - 277/480V SERVICE



NOTES:

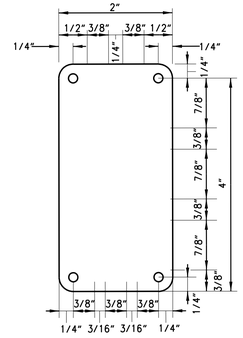
1. ALL WIRING FROM SERVICE FEEDS SHALL BE INSTALLED IN FLEXIBLE CONDUIT WITHIN THE LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE.
2. NO CONDUCTORS MAY ENTER OR EXIT THROUGH THE REAR OF ANY PANEL.
3. THE LIGHTING CONTACTOR SHALL BE PROPERLY SIZED ENCLOSURE.
4. A CONTINUOUS GROUNDING CONDUCTOR SHALL BE INSTALLED FROM THE METER PEDESTAL DISCONNECT SWITCH THROUGH ALL PANELS, THEN TO THE GROUNDING ELECTRODE.
5. ALL CONDUCTORS NOT IN CONDUIT SHALL BE BUNDLED OR WRAPPED AND SECURED IN CABINET AWAY FROM SHARP EDGES.
6. ALL CABLES SHALL MEET AMPACITY REQUIREMENTS OF THE NATIONAL ELECTRIC CODE. THE MINIMUM CABLE SIZE SHALL BE NO. 12 AWG.
7. ACTUAL NUMBER OF BREAKERS AND BREAKER RATING SHALL BE AS INDICATED ON PLANS AND RESPECTIVE PANEL SCHEDULES.

LIGHTING CONTROL CABINET 60A WITH SERVICE DISCONNECT



NOTES:

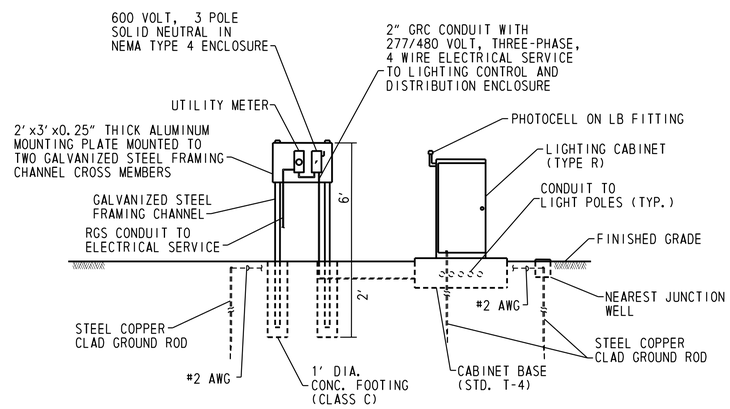
1). SEE DETAIL T-15, SHEET 1, FOR SIGN POST AND BREAKAWAY ASSEMBLY DETAILS.
2). ATTACH ALUMINUM PANEL TO SIGN POSTS WITH (6) ⅜" x 2½" LONG GRADE 5 BOLTS, FLAT WASHERS, AND NYLON LOCK NUTS, 3 ON EACH SIDE.
3). MOUNT METER SOCKET TO ALUMINUM PANEL WITH (4) ⅜" x ¾" STAINLESS STEEL BOLTS AND NYLON LOCK NUTS.
4). MOUNT DISCONNECT SWITCH TO ALUMINUM PANEL WITH (4) ⅜" x ¾" STAINLESS STEEL BOLTS AND NYLON LOCK NUTS.
5). ALL CONDUIT, CONDULETS AND OTHER ASSOCIATED PIECES SHALL BE 2" GALVANIZED UNLESS SPECIFIED DIFFERENTLY ON THE PLANS OR BY LOCAL UTILITY COMPANY.
6). WEATHERPROOF LIGHTING CONTROL CABINET SHALL CONTAIN LIGHTING CONTRACTOR AND APPROPRIATE OVERCURRENT PROTECTION FOR LIGHTING CIRCUIT(S) BEING USED.
7). THE SERVICE PEDESTAL AND 60 AMP CABINET SHALL BE INSTALLED OUTSIDE OF THE CLEAR ZONE.



TYPICAL POLE IDENTIFICATION TAG

NOTES:

1. IDENTIFICATION TAG SHALL BE INSTALLED ON THE SIDE OF THE POLE FACING AWAY FROM TRAFFIC.
2. POLE ARMS SHALL BE ALIGNED PERPENDICULAR TO THE EDGE OF TRAVELWAY, UNLESS OTHERWISE DIRECTED.
3. THE OUTER SLEEVE MEMBER AT THE LIGHT STANDARD FLUSH JOINT SHALL BE FURNISHED WITH PREDRILLED THROUGH HOLES AT 90 DEGREES APART (MIN. 6" DISTANCE BETWEEN HOLES). THE INNER MEMBER SHALL BE DRILLED IN THE FIELD AFTER THE POLE SHAFT IS INSTALLED AND THE DAVIT ARM IS ALIGNED.
4. CONTRACTOR SHALL COORDINATE WITH NORTH DISTRICT MAINTENANCE TO GET THE POLE NUMBERS.



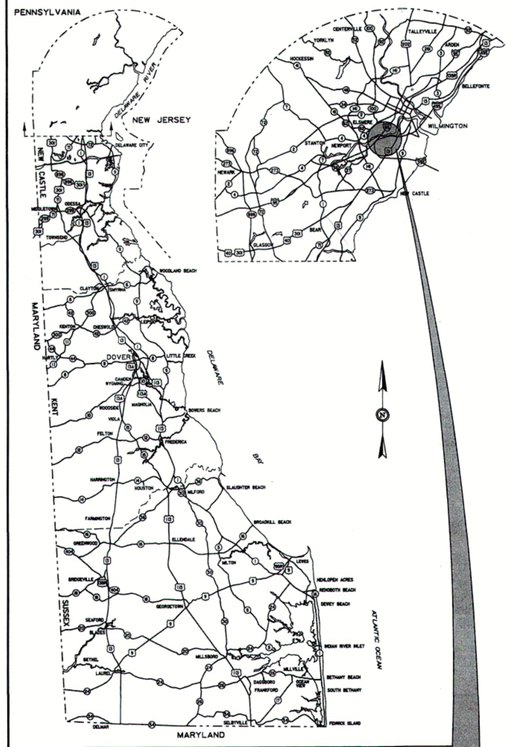
ELECTRICAL UTILITY SERVICE EQUIPMENT AND LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE DETAIL (277/480V)

ADDENDA / REVISIONS		NOT TO SCALE	PRICES CORNER INTERCHANGE LIGHTING DESIGN	CONTRACT T201880206	BRIDGE NO. X	LIGHTING DETAIL	LI-15 SECTION JMT SHEET NO. 19
				COUNTY NEW CASTLE	DESIGNED BY: KAB		
					CHECKED BY: MAW		

APPENDIX I.
SAMPLE PLAN – HIGH MAST LIGHTING DESIGN

THE STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION

U.S. CUSTOMARY UNITS



GENERAL LOCATION OF CONTRACT

CONSTRUCTION PLANS FOR:

I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS

CONTRACT NUMBER: T201509002

FEDERAL AID PROJECT NUMBER: ENHS-2015(27)

COUNTY: NEW CASTLE **M.R. #:** N33, N56, N59, N60

LIMIT OF CONSTRUCTION I-95, CHRISTINA RIVER

LIMIT OF CONSTRUCTION I-495, 600 FEET PRIOR TO EXIT 5

LIMIT OF CONSTRUCTION I-495, 300 FEET PAST US 13

LIMIT OF CONSTRUCTION I-495, 300 FEET PRIOR TO US 13

LIMIT OF CONSTRUCTION US 13, I-495

LIMIT OF CONSTRUCTION US 13, MEDORI BOULEVARD

LIMIT OF CONSTRUCTION I-95, RAMP TO I-295 NB

LIMIT OF CONSTRUCTION I-295, 2000 FEET PRIOR TO US 13

LOCATION MAP
SCALE: 1" = 3000'

PREPARED BY
THE CONSULTING FIRM OF

WRA
Whitman, Requardt & Associates, LLP
801 South Caroline Street, Baltimore, Maryland 21231

ROBERT STEPHEN MAHAR REGISTERED No. 7934 DELAWARE PROFESSIONAL ENGINEER
SEAL

RECOMMENDED _____ 3/16/2016
DATE

DESIGN DESIGNATION

FUNCTIONAL CLASS: INTERSTATE/OTHER PRINCIPAL ARTERIAL	D.H.V. PROJECTED: N/A	YEAR: N/A
TYPE OF CONSTRUCTION: ROADWAY LIGHTING	DESIGN SPEED: N/A	
A.A.D.T. CURRENT: 179,689 (I-95) YEAR: 2014	TRUCKS: N/A	
A.A.D.T. PROJECTED: N/A YEAR: N/A	DIRECTION OF DISTRIBUTION: N/A	

INDEX OF SHEETS

TOTAL SHEETS: 26

APPROVED DESIGN EXCEPTIONS

DESIGN PARAMETER	REQUIRED	PROVIDED	DATE

ADDENDA & REVISIONS

DESCRIPTION	NAME & DATE

ASSOCIATED CONTRACTS

CONTRACT NO.	CONTRACT NAME
DMB-13-01	I-295 SOUTHBOUND RECONSTRUCTION PROJECT FROM I-95 TO LANDERS LANE

RECOMMENDED
STORMWATER ENGINEER
DATE _____ SEAL

RECOMMENDED
SQUAD MANAGER, TRANSPORTATION SOLUTIONS (PROJECT DEVELOPMENT OR BRIDGE DESIGN)
DATE _____ SEAL

RECOMMENDED
BRIDGE DESIGN ENGINEER
DATE March 29, 2016

BARRY A. BENTON REGISTERED No. 10774 DELAWARE PROFESSIONAL ENGINEER
SEAL

RECOMMENDED
GROUP ENGINEER, NORTH DISTRICT DESIGN ENGINEER
DATE March 30, 2016

BRIAN J. SCHILLING LICENSE No. 16591 DELAWARE PROFESSIONAL ENGINEER
SEAL

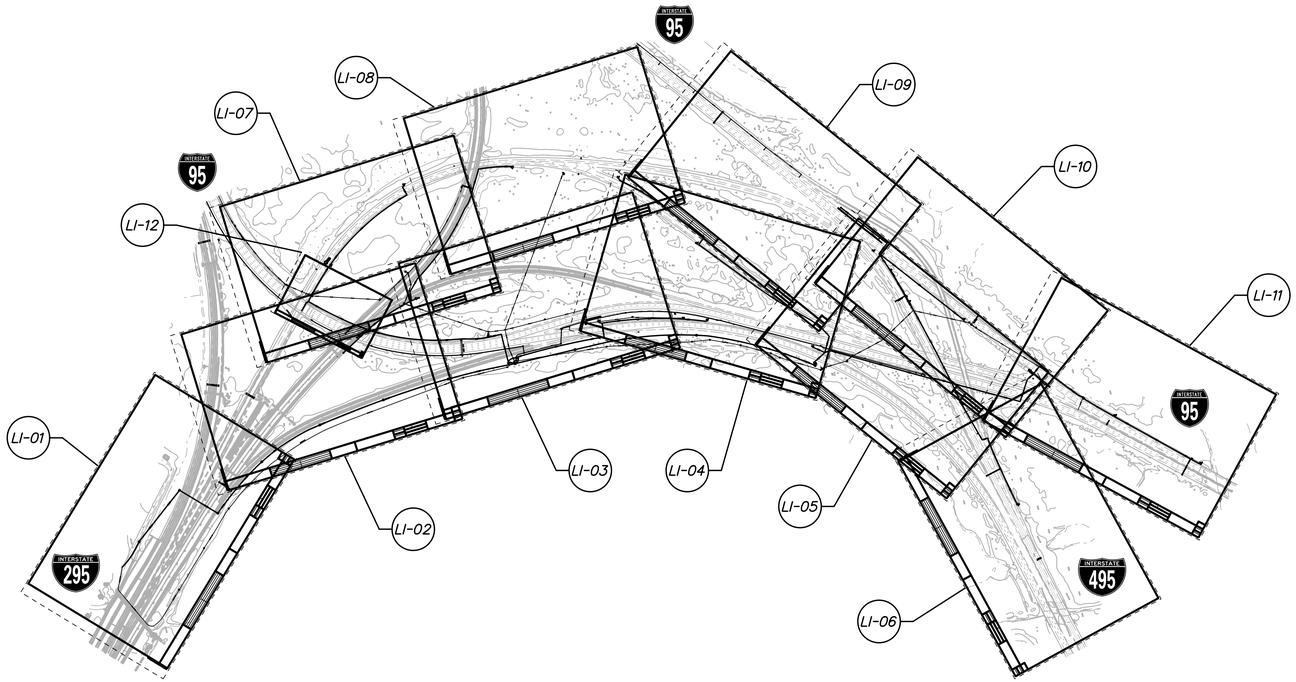
RECOMMENDED
ASSISTANT DIRECTOR, NORTH DISTRICT MAINTENANCE AND OPERATIONS
DATE APRIL 04, 2016

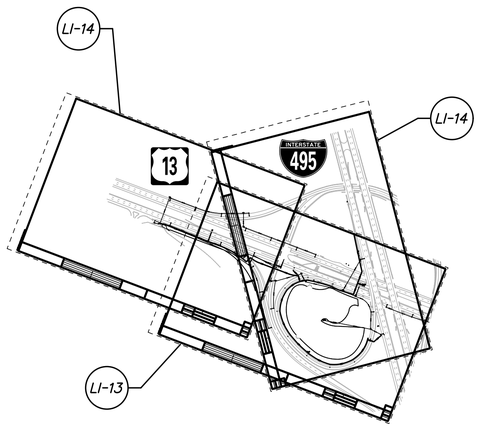
DONALD D. WEBER LICENSE No. 9176 DELAWARE PROFESSIONAL ENGINEER
SEAL

APPROVED
CHIEF ENGINEER
DATE April 4, 2016

ROBERT BRIAN MCCLEARY REGISTERED No. 8567 DELAWARE PROFESSIONAL ENGINEER
SEAL

LAST REVISED: 8/7/2008
N:\38882-005\CADD\TC01-I495_I95_LIGHTING.DGN





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DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS	

SCALE
0 500 1000 1500
FEET

I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS

CONTRACT	T201509002	
COUNTY	NEW CASTLE	
BRIDGE NO.	N/A	
DESIGNED BY:	WRA	
CHECKED BY:	WRA	

PLAN SHEET INDEX

	IS-01
SHEET NO.	2
TOTAL SHTS.	26

GENERAL NOTES

1. THIS PROJECT IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE DELAWARE DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS", DATED AUGUST 2001 AND THE DELAWARE DEPARTMENT OF TRANSPORTATION "STANDARD CONSTRUCTION DETAILS", DATED 2001, INCLUDING ALL REVISIONS UP TO THE DATE OF ADVERTISEMENT.

2. ELECTRONIC PROJECT FILES THAT WILL BE MADE AVAILABLE TO THE CONTRACTOR INCLUDE:

( )	NONE
( )	ASCII DATA FILES WITH COORDINATES AND ELEVATIONS FOR PROPOSED POINTS AS SELECTED BY THE ENGINEER.
(X)	ALL PLAN SHEETS, IN PDF FORMAT.
( )	EXISTING DIGITAL TERRAIN MODEL, IN .DTM FILE FORMAT, COMPATIBLE WITH SOFTWARE CURRENTLY USED BY DELDOT.
( )	PROPOSED DIGITAL TERRAIN MODEL, IN .DTM FILE FORMAT, COMPATIBLE WITH SOFTWARE CURRENTLY USED BY DELDOT.
( )	DESIGN FILE, IN .DGN FILE FORMAT, CONTAINING ONLY THE PROPOSED 3D TRIANGLES OF THE PROPOSED DIGITAL TERRAIN MODEL (DTM).

NOTE: THE DOCUMENT ENTITLED "RELEASE FOR DELIVERY OF DOCUMENTS IN ELECTRONIC FORM TO A CONTRACTOR" MUST BE SIGNED BY ALL PARTIES PRIOR TO THE DELIVERY OF ANY ELECTRONIC PROJECT FILES.

3. AMERICAN TRAFFIC SAFETY SERVICES ASSOCIATION (ATSSA) CERTIFIED TRAFFIC CONTROL SUPERVISOR REQUIREMENT FOR THIS PROJECT.

(X)	THE CONTRACTOR SHALL NOT BE REQUIRED TO HAVE AN ATSSA SUPERVISOR ASSIGNED TO THIS PROJECT.
( )	THE CONTRACTOR SHALL HAVE AN ATSSA SUPERVISOR ASSIGNED TO THIS PROJECT. THE CONTRACTOR'S GENERAL SUPERINTENDENT FOR THIS PROJECT OR ANOTHER ATSSA CERTIFIED MEMBER OF THE CONTRACTOR'S PROJECT STAFF MAY BE THE ATSSA SUPERVISOR. PAYMENT FOR ATSSA SUPERVISOR IS INCIDENTAL TO ITEM 743000.
( )	THE CONTRACTOR SHALL HAVE AN ATSSA SUPERVISOR ASSIGNED TO THIS PROJECT. THE ATSSA SUPERVISOR'S SOLE JOB SHALL BE SUPERVISION OF THE INSTALLATION, OPERATION AND MAINTENANCE OF TRAFFIC CONTROL DEVICES FOR THIS PROJECT. THE CONTRACTOR'S GENERAL SUPERINTENDENT FOR THIS PROJECT SHALL NOT BE THE ATSSA SUPERVISOR. PAYMENT FOR ATSSA SUPERVISOR SHALL BE PAID FOR UNDER ITEM 743031.

4. THE CONTRACTOR SHALL FOLLOW ALL STATE AND LOCAL ORDINANCES CONCERNING CONSTRUCTION NOISE DURING THE DURATION OF THE CONSTRUCTION ACTIVITIES.

5. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS PRIOR TO WORK.

6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH DRBA AND THE CONTRACTOR CONSTRUCTING DRBA CONTRACT NO. DMB-13-01. THE CONTRACTOR IS ADVISED THAT CONSTRUCTION OF CONTRACT NO. DMB-13-01 MAY BE ONGOING DURING CONSTRUCTION OF THIS CONTRACT AND THAT COORDINATION OF MAINTENANCE OF TRAFFIC, WORK ZONE ACCESS, PLACEMENT OF EQUIPMENT TO AVOID IMPACTS AND OTHER ITEMS MAY BE NECESSARY. THE CONTRACTOR MAY ALSO BE REQUIRED TO ATTEND COORDINATION MEETINGS WITH DRBA AND THE CONTRACT NO. DMB-13-01 CONTRACTOR. ALL REQUIRED COORDINATION WILL NOT BE MEASURED AND PAID FOR SEPARATELY, BUT WILL BE INCIDENTAL TO THE OVERALL CONTRACT.

7. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH DRBA AND NEW CASTLE COUNTY TO GAIN ACCESS TO WORK AREAS ALONG PORTIONS OF I-295.

PROJECT NOTES

SECTION 200

1. ITEMS TO BE REMOVED UNDER ITEM 211000 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS SHALL INCLUDE, BUT NOT BE LIMITED TO THE FOLLOWING: HIGH MAST LIGHT POLES, LOW LEVEL LIGHT POLES, POLE BASES, CABINET BASES, TRANSFORMER BASES, PEDESTAL BASES, JUNCTION WELLS, VAULTS, ELECTRICAL CABLES, AND ANY OTHER EQUIPMENT DESIGNATED FOR REMOVAL ON THE PLANS THAT IS NOT COVERED UNDER OTHER PAY ITEMS.

2. APPROVED COVERS SHALL BE INSTALLED OVER ALL LOADED TRUCKS OR TRAILERS HAULING BORROW, EXCAVATED MATERIALS, AGGREGATES, ETC. TO OR FROM THE PROJECT SITE OVER STATE MAINTAINED ROADS. THE COVERS SHALL BE INSTALLED TO PREVENT MATERIAL FROM LEAVING THE TRUCKS OR TRAILERS. THE MATERIAL SHALL BE FULLY COVERED AND THE COVERS TIED ON THE REAR AND BOTH SIDES. ANY MATERIALS DELIVERED, TRANSPORTED, OR REMOVED IN UNCOVERED TRUCKS OR TRAILERS WILL BE INCORPORATED INTO THE PROJECT, OR REMOVED FROM THE SITE, WITH NO PAYMENT TO THE CONTRACTOR FOR FURNISHING, REMOVING, OR PLACING THE MATERIALS.

3. WHEN PERFORMING ANY EXCAVATION OR BACKFILLING OPERATION, THE CONTRACTOR SHALL PROVIDE DEWATERING MEASURES AT ALL TIMES TO KEEP THE GROUNDWATER LEVEL AT LEAST ONE FOOT BELOW THE EXCAVATION ELEVATION, IN COMPLIANCE WITH DELDOT STANDARD SPECIFICATIONS, SECTION 111 - DEWATERING OPERATIONS. THE CONTRACTOR SHALL ALSO PROVIDE NECESSARY DEWATERING TO STABILIZE EXCAVATED SLOPES DURING CONSTRUCTION AND UNTIL THE SLOPES ARE STABILIZED AS DETERMINED BY THE ENGINEER. ALL COSTS SHALL BE INCIDENTAL TO THE APPLICABLE EXCAVATION OR BACKFILLING ITEM.

4. THE ENGINEER MAY REQUIRE THE CONTRACTOR TO EXCAVATE TEST PITS OR CONDUCT TEST HOLES TO DETERMINE THE DEPTH AND LOCATION OF EXISTING UTILITIES SO THEY CAN BE AVOIDED WHEN COMPLETING PROPOSED CONDUIT BORES, CONDUIT TRENCHING OR OTHER EQUIPMENT INSTALLATION.

SECTION 300

1. A. THE CONTRACTOR MAY ELECT TO USE ANY OF THE FOLLOWING MATERIALS TO MEET THE REQUIREMENTS OF ITEM 302007 - GRADED AGGREGATE BASE COURSE, TYPE 'B':
   a. CRUSHED STONE (PER STANDARD SPECIFICATION 821)
   b. CRUSHED CONCRETE (PER STANDARD SPECIFICATION 821)

   THE CONTRACTOR WILL NOT BE ALLOWED TO MIX DIFFERENT MATERIALS (OR SIMILAR MATERIALS FROM DIFFERENT SOURCES) TO MEET THE REQUIREMENTS OF ITEM 302007 - GRADED AGGREGATE BASE COURSE, TYPE 'B'.

   ALL OF THE ABOVE LISTED MATERIALS ARE PERMITTED FOR USE ON THE JOB, PROVIDED THEY ARE SEPARATED INTO APPROVED AREAS. EACH AREA OF BASE COURSE MUST BE CONSTRUCTED USING MATERIALS FROM A SINGULAR SOURCE, FULL DEPTH, IN ORDER THAT PROPER TESTING MAY BE ACCOMPLISHED. THE CONTRACTOR AND ENGINEER SHALL AGREE ON THE LIMITS OF EACH SOURCE OF MATERIAL PRIOR TO PLACEMENT.

   B. THE QUANTITY USED FOR BASE OF EACH OF THE ABOVE LISTED MATERIALS WILL BE THE CONTRACTOR'S CHOICE, WITH THE TOTAL BEING EQUAL TO THE ACTUAL QUANTITY USED UNDER ITEM 302007 - GRADED AGGREGATE BASE COURSE, TYPE 'B'.

SECTION 700

1. ALL UNDERDRAIN OUTLETS, CATCH BASINS, PIPES, CONDUITS, JUNCTION WELLS, ETC. IN GUARDRAIL AREAS OR NEAR OTHER CONSTRUCTION YET TO BE PERFORMED SHALL BE VISIBLY MARKED BY THE CONTRACTOR AT THE TIME OF INSTALLATION IN ORDER TO AVOID FUTURE DAMAGE DURING DRIVING OF THE GUARDRAIL POSTS OR PERFORMANCE OF OTHER CONSTRUCTION. THE LOCATION OF GUARDRAIL POSTS AND OTHER CONSTRUCTION SHALL BE STAKED IN THE FIELD PRIOR TO PLACING THESE ITEMS. THE LOCATION OF THESE ITEMS SHALL BE ADJUSTED TO AVOID CONFLICTS WITH THE GUARDRAIL OR OTHER CONSTRUCTION. ALTERATIONS TO THE GUARDRAIL POST SPACING WILL NOT BE ALLOWED. ANY WORK REQUIRED TO RELOCATE THESE ITEMS DUE TO CONFLICTS WITH GUARDRAIL OR OTHER CONSTRUCTION SHALL BE PERFORMED TO THE SATISFACTION OF THE ENGINEER AND SHALL BE AT THE CONTRACTOR'S EXPENSE, INCLUDING ANY REMOVAL AND REPLACEMENT OF PAVEMENT.

2. THE COST OF ANY FLOODLIGHTING NECESSARY DUE TO WORK BY THE CONTRACTOR ON ANY ITEM OCCURRING AFTER DARK SHALL BE INCIDENTAL TO THE BID PRICE OF THE ITEM BEING CONSTRUCTED. DURING NIGHT WORK, ALL PERSONS WITHIN THE WORK ZONE SHALL HAVE SAFETY WEAR IN ACCORDANCE WITH THE DEMUTCD.

LIGHTING GENERAL NOTES:

1. ALL GROUND WIRE CONNECTIONS TO GROUND RODS SHALL BE COMPLETED USING EXOTHERMIC WELDS.

2. THE CONTRACTOR SHALL COORDINATE WITH THE ENGINEER ON THE LOCATIONS OF ALL CONDUIT, JUNCTION WELLS, POLE BASES AND EQUIPMENT BASES TO ELIMINATE CONSTRUCTION CONFLICTS. THE CONTRACTOR SHALL STAKE ALL PROPOSED EQUIPMENT LOCATIONS FOR APPROVAL BY THE ENGINEER BEFORE INSTALLATION.

3. COLOR CODING SHALL BE PROVIDED THROUGHOUT THE ENTIRE NETWORK FOR SERVICE, FEEDER, BRANCH AND CONTROL CONDUCTORS. EACH PHASE SHALL BE AN INDEPENDENT COLOR. CONDUCTORS SHALL HAVE FACTORY IMPREGNATED COLOR THROUGHOUT THEIR ENTIRE LENGTH.

4. ALL FUSED CONNECTIONS SHALL BE MADE IN THE POLE BASE. SPLICES IN JUNCTION BOXES OR PULL BOXES SHALL NOT BE FUSED.

5. ALL CONDUITS SHALL BE BONDED IN A CONTINUOUS RUN FROM THE SOURCE BY A COPPER GROUNDING CONDUCTOR WITH SIZE AS NOTED ON PLANS. 10 FEET OF ADDITIONAL SLACK FOR EACH GROUND WIRE IN EACH JUNCTION WELL SHALL BE PROVIDED AND NEATLY COILED.

6. ALL STATION, OFFSET AND DIMENSION INFORMATION SHOWN FOR PROPOSED LIGHTING STANDARDS IS TO THE CENTER OF THE PROPOSED POLE BASE.

7. ALL PROPOSED CONDUITS (SERVICE RUNS) SHALL BE RIGID POLYVINYL CHLORIDE SCHEDULE 80 WHEN INSTALLED BY TRENCHING AND SDR-13.5 HDPE WHEN INSTALLED BY BORING, UNLESS OTHERWISE NOTED ON PLANS.

8. SPLICES FOR ALL ROADWAY LIGHTING ELECTRICAL CABLES SHALL BE COMPLETED USING APPROVED SPLICE KITS OR METHODS APPROVED BY THE ENGINEER AND SHALL BE INCIDENTAL TO THE SUPPLY AND INSTALLATION OF THE VARIOUS ROADWAY LIGHTING ELECTRICAL CABLES.

9. (1) 3/4" DIAMETER BY 10' LONG GROUND ROD SHALL BE INSTALLED AT EACH LIGHTING STANDARD POLE BASE. (1) 3/4" DIAMETER BY 10' LONG GROUND ROD SHALL BE INSTALLED IN THE JUNCTION WELL CLOSEST TO THE LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE AND THE BARE COPPER GROUNDING CONDUCTORS FOR EACH RUN OF CIRCUITS SHALL BE CONNECTED TO THE GROUND ROD. (1) 3/4" DIAMETER BY 10' LONG GROUND ROD SHALL BE INSTALLED AT THE LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE WHICH SHALL BE BONDED TO THE GROUND ROD IN THE JUNCTION WELL CLOSEST TO THE LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE. (1) 3/4" DIAMETER BY 10' LONG GROUND ROD SHALL BE INSTALLED AT THE ELECTRIC SERVICE PEDESTAL. GROUND RODS SHALL BE SEPARATED BY A MINIMUM OF 6 FEET.

10. THE EXISTING ELECTRICAL CABLES IN ALL CONDUITS DESIGNATED TO BE ABANDONED SHALL BE REMOVED AS DIRECTED BY THE ENGINEER. THE EXISTING CONDUITS SHALL BE CAPPED AND ABANDONED IN PLACE.

11. ALL FOUNDATIONS FOR EXISTING LIGHT POLES OR EQUIPMENT DESIGNATED TO BE REMOVED SHALL BE REMOVED TO A DEPTH OF 1'-0" BELOW FINISHED GRADE. THE AREA SHALL BE BACKFILLED, SEEDED AND MULCHED.

12. ALL PROPOSED ROADWAY LIGHTING CONDUITS (SERVICE RUNS) SHALL BE SEALED WITH A DUCT SEAL/WATER BLOCK FOAM (POLYWATER FST OR APPROVED EQUAL). SEALING LIGHTING CONDUITS WILL NOT BE MEASURED AND PAID FOR BUT WILL BE INCIDENTAL TO THE PERTINENT FURNISH AND INSTALL ELECTRICAL CABLE ITEMS.

13. THE CONTRACTOR SHALL VERIFY THAT THE REMOVAL OF AN EXISTING JUNCTION WELL DESIGNATED TO BE REMOVED OR THE ABANDONING OF EXISTING ELECTRICAL CONDUITS AND CABLES DESIGNATED TO BE ABANDONED WILL NOT ADVERSELY AFFECT EXISTING EQUIPMENT TO REMAIN PRIOR TO REMOVAL OR ABANDONING OF EQUIPMENT AS SHOWN ON THE PLANS.

14. THE EXISTING LIGHTING SYSTEM SHALL REMAIN OPERATIONAL UNTIL THE PROPOSED LIGHTING SYSTEM IS CONSTRUCTED AND READY TO BE ENERGIZED. OUTAGES TO THE ROADWAY LIGHTING ARE EXPECTED WHEN TRANSITIONING FROM THE EXISTING TO PROPOSED SYSTEMS AND DURING THE TRANSITION OF THE 13.2 KV SERVICE LINE. OUTAGES SHOULD BE MINIMIZED TO THE FULLEST EXTENT POSSIBLE.

15. SERVICE RUNS ARE SHOWN IN APPROXIMATE LOCATIONS. THE CONTRACTOR SHALL LOCATE THE SERVICE RUNS IN A MANNER THAT AVOIDS CONFLICTS WITH ALL EXISTING AND PROPOSED FEATURES AS FIELD CONDITIONS DICTATE AND AS APPROVED BY THE ENGINEER.

16. WHERE THE PLANS INDICATE TWO CONDUITS TO BE INSTALLED BETWEEN THE LIGHT POLE BASE AND ADJACENT JUNCTION WELL, ONE CONDUIT SHALL BE USED AS A SPARE AS SPECIFIED BY SECTION 5.9 OF THE DELDOT LIGHTING DESIGN GUIDELINES.

UTILITY GENERAL NOTES:

1. ALL CONDUITS FOR THE 13.2 KV SERVICE LINE SHALL BE INSTALLED WITH A MINIMUM COVER OF 36 INCHES MEASURED FROM FINISHED GRADE. ALL CONDUITS SHALL BE MARKED WITH WARNING TAPE.

2. EXISTING UTILITY LOCATIONS SHOWN ON THE PLANS ARE APPROXIMATE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXACT LOCATIONS PRIOR TO COMMENCING WORK.

3. IF ANY UTILITY IS DAMAGED THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE OWNER OF THE UTILITY IMMEDIATELY. ANY DAMAGE TO THE UTILITIES SHALL BE REPAIRED BY THE CONTRACTOR AT HIS EXPENSE UNDER THE DIRECTION OF THE UTILITY OWNER.

4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLATION OF CONDUITS, MANHOLES, ELECTRICAL CABLES, CABLE SPLICES, CABLE TERMINATIONS, AND TRANSFORMER PADS FOR THE 13.2 KV SERVICE LINE UPGRADE. DELMARVA POWER WILL COMPLETE FINAL CABLE CONNECTIONS, UPGRADE SERVICE POLE, INSTALL NEW TRANSFORMERS AND REMOVE EXISTING TRANSFORMERS. THE CONTRACTOR SHALL COORDINATE ALL CONSTRUCTION FOR THE 13.2 KV SERVICE LINE UPGRADE WITH DELMARVA POWER AND ENSURE THE LOCATION OF ALL PROPOSED EQUIPMENT IS APPROVED PRIOR TO INSTALLATION.

5. THE CONTRACTOR SHALL COMPLETE HIS PORTION OF THE WORK FOR THE 13.2 KV SERVICE LINE UPGRADE PRIOR TO REQUESTING DE-ENERGIZATION OF THE EXISTING LINE AND ENGERGIZATION OF THE NEW LINE BY DELMARVA POWER SO THAT DOWN TIME IS MINIMIZED. THE CONTRACTOR SHALL ARRANGE A MEETING WITH DELMARVA POWER, DELDOT NORTH DISTRICT AND THE ENGINEER TO COORDINATE THE SERVICE TRANSITION AND ENSURE THAT POWER IS AVAILABLE WHEN REQUIRED.

6. THE CONTRACTOR SHALL COORDINATE ALL WORK INVOLVING DELMARVA POWER WITH TOM SMITH (302-283-5757).

LIGHTING SYMBOL LEGEND

SYMBOL	DESCRIPTION
	– PROPOSED LIGHTING STANDARD
	– EXISTING LIGHTING STANDARD
	– HIGH MAST LIGHTING STANDARD (EXISTING AND PROPOSED)
	– PROPOSED UNDERPASS LUMINAIRE
MA	– PROPOSED MANHOLE AND IDENTIFIER
CA X	– PROPOSED LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE AND IDENTIFIER
CA X	– EXISTING LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE AND IDENTIFIER
	– PROPOSED JUNCTION WELL LIGHTING
	– EXISTING JUNCTION WELL (OTHER)
J.W.	– EXISTING JUNCTION WELL LIGHTING
T T	– ELECTRICAL TRANSFORMER (EXISTING AND PROPOSED)
E	– EXISTING ELECTRICAL VAULT
P P	– ELECTRIC UTILITY SERVICE EQUIPMENT (EXISTING AND PROPOSED)
—LI-CON—	– PROPOSED LIGHTING SERVICE RUN (CONDUIT)
—EX-CON—	– EXISTING SERVICE RUN
—HIGH VOLT—	– PROPOSED PRIMARY SERVICE RUN
–EX. HIGH VOLT–	– EXISTING HIGH VOLTAGE LINE
LS LS	– LIGHTING STANDARD IDENTIFIER (EXISTING AND PROPOSED)
SR SR	– SERVICE RUN IDENTIFIER (EXISTING AND PROPOSED)
JW JW	– JUNCTION WELL IDENTIFIER (TYPE) (EXISTING AND PROPOSED)
JB	– EXISTING STRUCTURE MOUNTED JUNCTION BOX IDENTIFIER
RM C RM O	– REMOVE BY CONTRACTOR / REMOVE BY OTHERS
AB	– ABANDON BY CONTRACTOR

TRAFIC CONTROL NOTES:

1. NO EQUIPMENT SHALL BE STORED IN THE MEDIAN, OR WITHIN THE CLEAR ZONE, AT ANY TIME DURING NON-WORKING HOURS.

2. A TYPE II TRUCK MOUNTED ATTENUATOR (TMA) SHALL BE REQUIRED ON THIS PROJECT DURING ALL LANE CLOSURES AND SHOULDER CLOSURES WHERE WORKERS OR EQUIPMENT ARE PRESENT IN A CLOSED TRAVEL LANE OR CLOSED SHOULDER, AS DIRECTED BY THE ENGINEER. THE ROLL AHEAD DISTANCE SHALL BE AS PER THE MANUFACTURER'S RECOMMENDATIONS. THE TMA SHALL CONFORM TO THE REQUIREMENTS OF SECTION 6F.82 OF THE DELAWARE MUTCD.

3. A TRAFFIC OFFICER SHALL BE REQUIRED DURING THE SET UP AND REMOVAL OF TRAFFIC CONTROL DEVICES FOR CONSTRUCTION ACTIVITIES THAT REQUIRE A LANE CLOSURE AND FOR TRAFFIC DRAGS DURING THE REMOVAL AND ERECTION OF THE HIGH MAST LIGHT POLES, AS DIRECTED BY THE ENGINEER.

4. MAINTENANCE OF TRAFFIC DURING CONSTRUCTION ACTIVITIES OR OTHER OPERATIONS SHALL CONFORM TO TYPICAL APPLICATIONS 3A, 5A, 5B, 33, 37, 42, 43 & 44, AS DIRECTED BY THE ENGINEER .

5. ALL WORK REQUIRING A SINGLE LANE CLOSURE USING TYPICAL APPLICATION 5B OR 33 SHALL NOT BE PERMITTED BETWEEN 6:00 AM AND 9:00 AM OR BETWEEN 3:00 PM AND 6:00 PM.

6. ALL WORK REQUIRING A DOUBLE LANE CLOSURE USING TYPICAL APPLICATION 37 SHALL NOT BE PERMITTED BETWEEN 5:00 AM AND 10:00 AM OR BETWEEN 2:00 PM AND 7:00 PM.

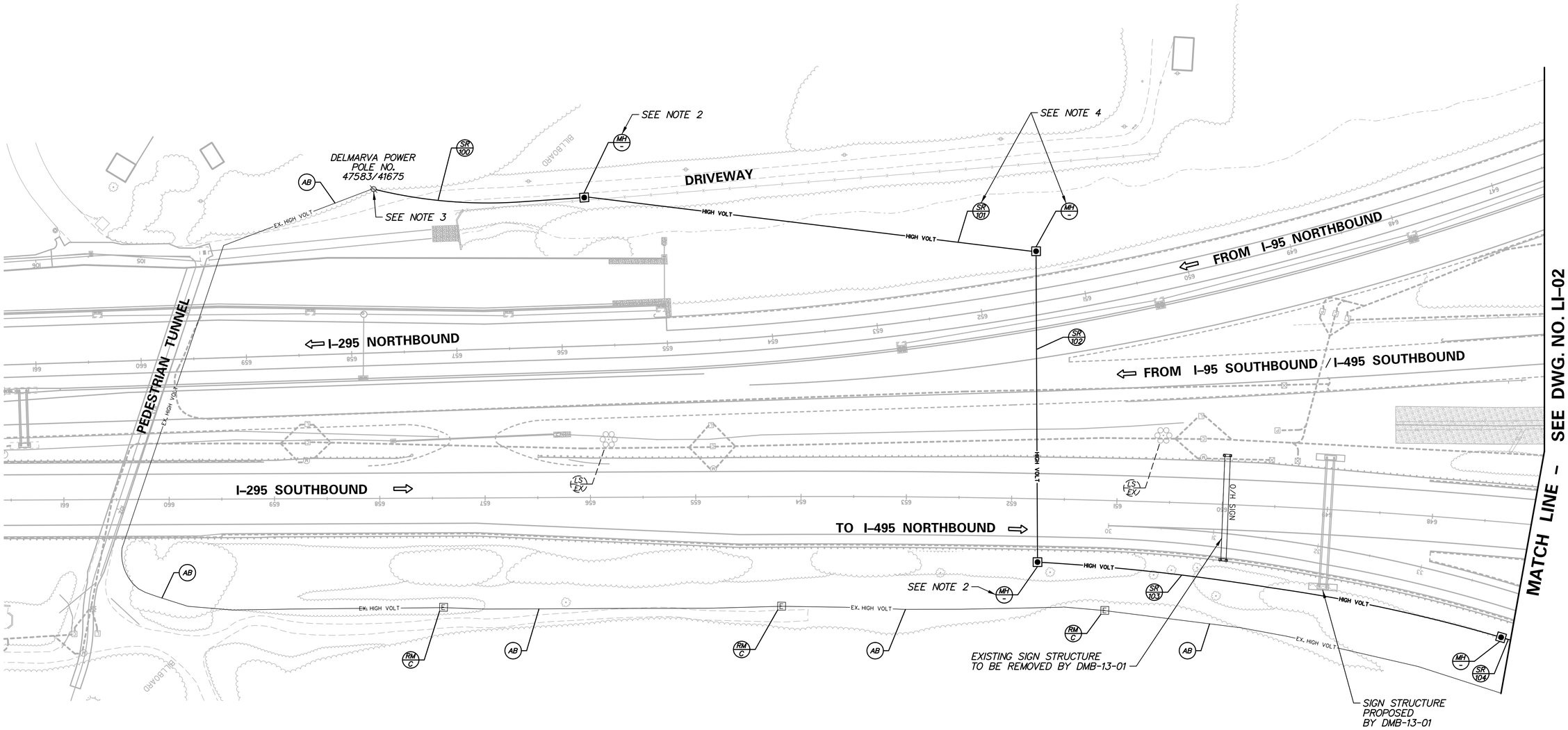
13.2 KV SERVICE SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
100	1	4.0"	190	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	TRENCH
	1	4.0"	190	EMPTY SPARE	TRENCH
101	1	4.0"	446	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	BORE
	1	4.0"	446	EMPTY SPARE	BORE
102	1	4.0"	296	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	BORE
	1	4.0"	296	EMPTY SPARE	BORE
103	1	4.0"	452	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	TRENCH
	1	4.0"	452	EMPTY SPARE	TRENCH
104	1	4.0"	452*	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	TRENCH
	1	4.0"	452*	EMPTY SPARE	TRENCH

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.

NOTES:

1. ALL LINEWORK ON THIS PLAN SHOWN SCREENED (GREYSCALE) REFLECTS EXISTING CONDITIONS OR CONSTRUCTION PROPOSED BY OTHERS UNDER DRBA CONTRACT NO. DMB-13-01. THE BASELINE(S) SHOWN ARE NOT TO BE STAKED OUT IN THIS PROJECT, BUT ARE PROVIDED FOR REFERENCE PURPOSES FOR COORDINATION WITH DMB-13-01.
2. PULL ELECTRICAL CABLES THROUGH MANHOLE WITHOUT SPLICING. COIL AND STORE 20 FEET OF SLACK FOR EACH CONDUCTOR CABLE IN THE MANHOLE.
3. THE CONTRACTOR SHALL COORDINATE WITH DELMARVA POWER WHO WILL UPGRADE EXISTING POLE NO. 47583/41675 WITH A NEW POLE-MOUNTED FUSED CUTOUT SWITCH. THE CONTRACTOR SHALL SWEEP THE PROPOSED (2) 4 INCH CONDUITS 2 FEET ABOVE GRADE AT THE BASE OF THE POLE AND TERMINATE CABLES WITH 50 FEET OF SLACK FOR EACH CONDUCTOR COILED FOR DELMARVA POWER TO MAKE FINAL CONNECTIONS. SEE DWG. NO. LI-15 FOR 13.2 KV SERVICE LINE SINGLE-LINE DIAGRAM.
4. THE CONTRACTOR IS ADVISED THAT BORING OF PROPOSED CONDUITS WILL REQUIRE DEEP DRILLING TO MAINTAIN A MINIMUM COVER OF 36 INCHES BELOW FINISHED GRADE WHEN CROSSING UNDER THE EXISTING STREAM BED AND A TURN UPWARD TO BREACH GRADE FOR THE MANHOLE ALONG THE RAMP FROM I-95 NORTHBOUND THAT IS SET AT A HIGHER ELEVATION.



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DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 50 100 150 FEET	I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS	CONTRACT T201509002	BRIDGE NO. N/A	LIGHTING PLAN
				COUNTY NEW CASTLE	DESIGNED BY: WRA	
					CHECKED BY: WRA	

LI-01
SHEET NO. 4
TOTAL SHTS. 26

LIGHTING SERVICE SCHEDULE

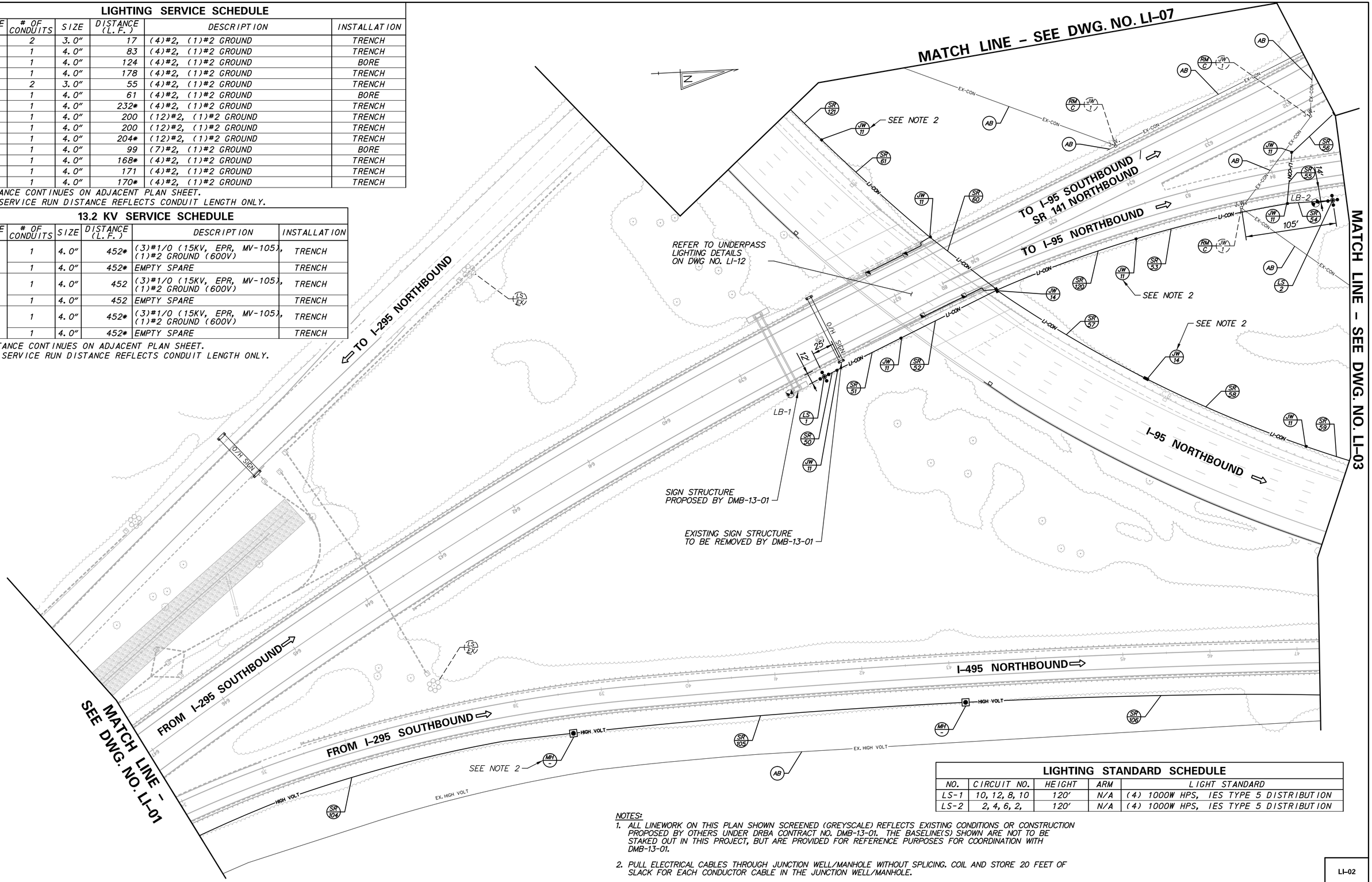
SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
50	2	3.0"	17	(4)#2, (1)#2 GROUND	TRENCH
51	1	4.0"	83	(4)#2, (1)#2 GROUND	TRENCH
52	1	4.0"	124	(4)#2, (1)#2 GROUND	BORE
53	1	4.0"	178	(4)#2, (1)#2 GROUND	TRENCH
54	2	3.0"	55	(4)#2, (1)#2 GROUND	TRENCH
55	1	4.0"	61	(4)#2, (1)#2 GROUND	BORE
56	1	4.0"	232*	(4)#2, (1)#2 GROUND	TRENCH
57	1	4.0"	200	(12)#2, (1)#2 GROUND	TRENCH
58	1	4.0"	200	(12)#2, (1)#2 GROUND	TRENCH
59	1	4.0"	204*	(12)#2, (1)#2 GROUND	TRENCH
60	1	4.0"	99	(7)#2, (1)#2 GROUND	BORE
61	1	4.0"	168*	(4)#2, (1)#2 GROUND	TRENCH
120	1	4.0"	171	(4)#2, (1)#2 GROUND	TRENCH
121	1	4.0"	170*	(4)#2, (1)#2 GROUND	TRENCH

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.

13.2 KV SERVICE SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
104	1	4.0"	452*	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	TRENCH
	1	4.0"	452*	EMPTY SPARE	TRENCH
105	1	4.0"	452	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	TRENCH
	1	4.0"	452	EMPTY SPARE	TRENCH
106	1	4.0"	452*	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	TRENCH
	1	4.0"	452*	EMPTY SPARE	TRENCH

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.



LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	HEIGHT	ARM	LIGHT STANDARD
LS-1	10, 12, 8, 10	120'	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION
LS-2	2, 4, 6, 2,	120'	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION

NOTES:

1. ALL LINEWORK ON THIS PLAN SHOWN SCREENED (GREYSCALE) REFLECTS EXISTING CONDITIONS OR CONSTRUCTION PROPOSED BY OTHERS UNDER DRBA CONTRACT NO. DMB-13-01. THE BASELINE(S) SHOWN ARE NOT TO BE STAKED OUT IN THIS PROJECT, BUT ARE PROVIDED FOR REFERENCE PURPOSES FOR COORDINATION WITH DMB-13-01.
2. PULL ELECTRICAL CABLES THROUGH JUNCTION WELL/MANHOLE WITHOUT SPLICING. COIL AND STORE 20 FEET OF SLACK FOR EACH CONDUCTOR CABLE IN THE JUNCTION WELL/MANHOLE.

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DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE
0 50 100 150
FEET

I-95/I-295/I-495 INTERSTATE
HIGH MAST LIGHTING
IMPROVEMENTS

CONTRACT	T201509002
COUNTY	NEW CASTLE
BRIDGE NO.	N/A
DESIGNED BY:	WRA
CHECKED BY:	WRA

LIGHTING PLAN

LI-02

SHEET NO.	5
TOTAL SHTS.	26

13.2 KV SERVICE SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
106	1	4.0"	452*	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	TRENCH
	1	4.0"	452*	EMPTY SPARE	TRENCH
107	1	4.0"	452	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	TRENCH
	1	4.0"	452	EMPTY SPARE	TRENCH
108	1	4.0"	406	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	TRENCH
	1	4.0"	406	EMPTY SPARE	TRENCH
109	1	4.0"	406	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	TRENCH
	1	4.0"	406	EMPTY SPARE	TRENCH
110	1	4.0"	406*	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	TRENCH
	1	4.0"	406*	EMPTY SPARE	TRENCH

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.

NOTES:
1. ALL LINEWORK ON THIS PLAN SHOWN SCREENED (GREYSCALE) REFLECTS EXISTING CONDITIONS OR CONSTRUCTION PROPOSED BY OTHERS UNDER DRBA CONTRACT NO. DMB-13-01. THE BASELINE(S) SHOWN ARE NOT TO BE STAKED OUT IN THIS PROJECT, BUT ARE PROVIDED FOR REFERENCE PURPOSES FOR COORDINATION WITH DMB-13-01.
2. FOLLOWING ENERGIZATION OF THE NEW 13.2 KV LINE AND DEENERGIZATION OF THE EXISTING 13.2 KV LINE THE CONTRACTOR SHALL REMOVE ALL EXISTING ELECTRICAL VAULTS AND ABANDON ALL EXISTING LINES. THE CONTRACTOR SHALL COORDINATE WITH DELMARVA POWER FOR THE REMOVAL OF THE EXISTING PAD MOUNTED TRANSFORMER.
3. REMOVE THE EXISTING GUARDRAIL END TREATMENT AND GUARDRAIL AS SHOWN ON PLANS.
4. TIE AND TRANSITION PROPOSED TYPE 1-31 GUARDRAIL INTO THE EXISTING TYPE 1-27 GUARDRAIL PER STD. NO. B-7.

LIGHTING SERVICE SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
59	1	4.0"	204*	(12)#2, (1)#2 GROUND	TRENCH
62	1	4.0"	205	(12)#2, (1)#2 GROUND	TRENCH
63	2	3.0"	10	(4)#2, (1)#2 GROUND	TRENCH
64	1	4.0"	86	(12)#2, (1)#2 GROUND	TRENCH
65	1	4.0"	192	(12)#2, (1)#2 GROUND	BORE
66	4	4.0"	7	(8)#2, (1)#2 GROUND IN 1 CONDUIT (8)#2, (1)#2 GROUND IN 1 CONDUIT 2 CONDUITS ARE SPARES	TRENCH
67**	1	3.0"	12	(4)#4/0, (1)#2 GROUND	TRENCH
68**	1	3.0"	34	(4)#4/0, (1)#2 GROUND	TRENCH
69	1	4.0"	292	(4)#2, (1)#2 GROUND	TRENCH
70	1	4.0"	173	(4)#2, (1)#2 GROUND	TRENCH
71	1	4.0"	93	(4)#2, (1)#2 GROUND	BORE
72	2	3.0"	20	(4)#2, (1)#2 GROUND	TRENCH
73	1	4.0"	226	(4)#2, (1)#2 GROUND	TRENCH
122	1	4.0"	197	(4)#2, (1)#2 GROUND	TRENCH
123	1	4.0"	231*	(4)#2, (1)#2 GROUND	TRENCH

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
** GALVANIZED RIGID CONDUIT.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.

ITMS CONDUIT RUN SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
300	1	2.0"	72	REMOVE EX. (2)#4, EX. (1)#6 GROUND TO REMAIN, INSTALL (2)#2***	EXISTING
301	1	2.0"	251	REMOVE EX. (2)#4, EX. (1)#6 GROUND TO REMAIN, INSTALL (2)#2***	EXISTING
302	1	2.0"	105	REMOVE EX. (2)#4, EX. (1)#6 GROUND TO REMAIN, INSTALL (2)#2***	EXISTING
303	1	2.0"	47	EX. (2)#6 TO REMAIN, EX. (1)#6 GROUND TO REMAIN	EXISTING
304	1	2.0"	435	REMOVE EX. (2)#4, EX. (1)#6 GROUND TO REMAIN, INSTALL (2)#2***	EXISTING
305	1	2.0"	610*	REMOVE EX. (2)#4, EX. (1)#6 GROUND TO REMAIN, INSTALL (2)#2***	EXISTING
140**	1	2.0"	44	(4)#2, (1)#6 GROUND	TRENCH***
141**	1	2.0"	15	(4)#2, (1)#6 GROUND	TRENCH***

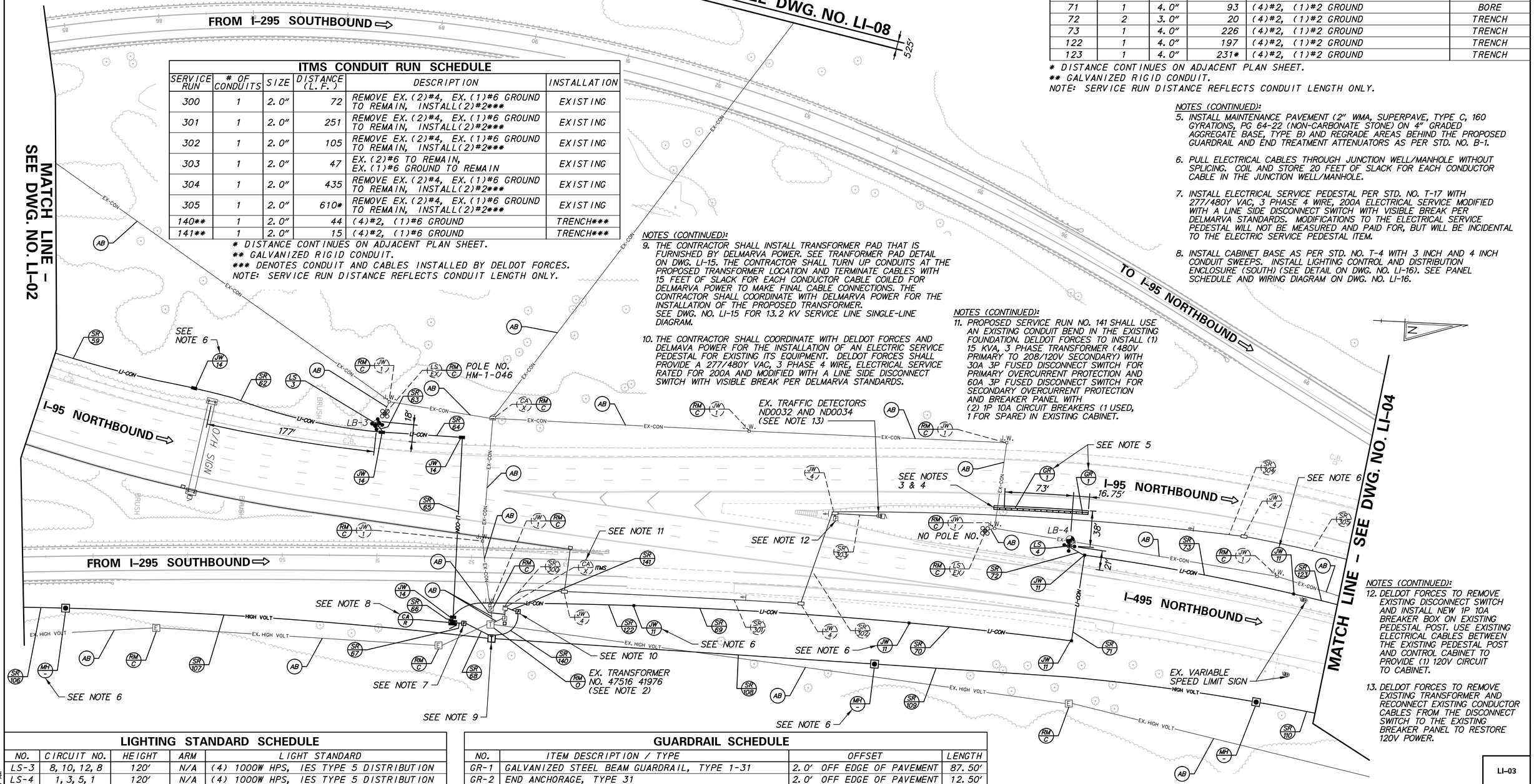
* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
** GALVANIZED RIGID CONDUIT.
*** DENOTES CONDUIT AND CABLES INSTALLED BY DELDOT FORCES.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.

NOTES (CONTINUED):
9. THE CONTRACTOR SHALL INSTALL TRANSFORMER PAD THAT IS FURNISHED BY DELMARVA POWER. SEE TRANFORMER PAD DETAIL ON DWG. LI-15. THE CONTRACTOR SHALL TURN UP CONDUITS AT THE PROPOSED TRANSFORMER LOCATION AND TERMINATE CABLES WITH 15 FEET OF SLACK FOR EACH CONDUCTOR CABLE COILED FOR DELMARVA POWER TO MAKE FINAL CABLE CONNECTIONS. THE CONTRACTOR SHALL COORDINATE WITH DELMARVA POWER FOR THE INSTALLATION OF THE PROPOSED TRANSFORMER. SEE DWG. NO. LI-15 FOR 13.2 KV SERVICE LINE SINGLE-LINE DIAGRAM.
10. THE CONTRACTOR SHALL COORDINATE WITH DELDOT FORCES AND DELMAVA POWER FOR THE INSTALLATION OF AN ELECTRIC SERVICE PEDESTAL FOR EXISTING ITS EQUIPMENT. DELDOT FORCES SHALL PROVIDE A 277/480Y VAC, 3 PHASE 4 WIRE, ELECTRICAL SERVICE RATED FOR 200A AND MODIFIED WITH A LINE SIDE DISCONNECT SWITCH WITH VISIBLE BREAK PER DELMARVA STANDARDS.

NOTES (CONTINUED):
11. PROPOSED SERVICE RUN NO. 141 SHALL USE AN EXISTING CONDUIT BEND IN THE EXISTING FOUNDATION. DELDOT FORCES TO INSTALL (1) 15 KVA, 3 PHASE TRANSFORMER (480V PRIMARY TO 208/120V SECONDARY) WITH 30A 3P FUSED DISCONNECT SWITCH FOR PRIMARY OVERCURRENT PROTECTION AND 60A 3P FUSED DISCONNECT SWITCH FOR SECONDARY OVERCURRENT PROTECTION AND BREAKER PANEL WITH (2) 1P 10A CIRCUIT BREAKERS (1 USED, 1 FOR SPARE) IN EXISTING CABINET.

NOTES (CONTINUED):
5. INSTALL MAINTENANCE PAVEMENT (2" WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 64-22 (NON-CARBONATE STONE) ON 4" GRADED AGGREGATE BASE, TYPE B) AND REGRADE AREAS BEHIND THE PROPOSED GUARDRAIL AND END TREATMENT ATTENUATORS AS PER STD. NO. B-1.
6. PULL ELECTRICAL CABLES THROUGH JUNCTION WELL/MANHOLE WITHOUT SPLICING. COIL AND STORE 20 FEET OF SLACK FOR EACH CONDUCTOR CABLE IN THE JUNCTION WELL/MANHOLE.
7. INSTALL ELECTRICAL SERVICE PEDESTAL PER STD. NO. T-17 WITH 277/480Y VAC, 3 PHASE 4 WIRE, 200A ELECTRICAL SERVICE MODIFIED WITH A LINE SIDE DISCONNECT SWITCH WITH VISIBLE BREAK PER DELMARVA STANDARDS. MODIFICATIONS TO THE ELECTRICAL SERVICE PEDESTAL WILL NOT BE MEASURED AND PAID FOR, BUT WILL BE INCIDENTAL TO THE ELECTRIC SERVICE PEDESTAL ITEM.
8. INSTALL CABINET BASE AS PER STD. NO. T-4 WITH 3 INCH AND 4 INCH CONDUIT SWEEPS. INSTALL LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE (SOUTH) (SEE DETAIL ON DWG. NO. LI-16). SEE PANEL SCHEDULE AND WIRING DIAGRAM ON DWG. NO. LI-16.

NOTES (CONTINUED):
12. DELDOT FORCES TO REMOVE EXISTING DISCONNECT SWITCH AND INSTALL NEW 1P 10A BREAKER BOX ON EXISTING PEDESTAL POST. USE EXISTING ELECTRICAL CABLES BETWEEN THE EXISTING PEDESTAL POST AND CONTROL CABINET TO PROVIDE (1) 120V CIRCUIT TO CABINET.
13. DELDOT FORCES TO REMOVE EXISTING TRANSFORMER AND RECONNECT EXISTING CONDUCTOR CABLES FROM THE DISCONNECT SWITCH TO THE EXISTING BREAKER PANEL TO RESTORE 120V POWER.



LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	HEIGHT	ARM	LIGHT STANDARD
LS-3	8, 10, 12, 8	120'	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION
LS-4	1, 3, 5, 1	120'	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION

GUARDRAIL SCHEDULE

NO.	ITEM DESCRIPTION / TYPE	OFFSET	LENGTH
GR-1	GALVANIZED STEEL BEAM GUARDRAIL, TYPE 1-31	2.0' OFF EDGE OF PAVEMENT	87.50'
GR-2	END ANCHORAGE, TYPE 31	2.0' OFF EDGE OF PAVEMENT	12.50'

DELAWARE DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE 0 50 100 150 FEET

I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS

CONTRACT	T201509002
COUNTY	NEW CASTLE
BRIDGE NO.	N/A
DESIGNED BY:	WRA
CHECKED BY:	WRA

LIGHTING PLAN

LI-03

SHEET NO.	6
TOTAL SHTS.	26

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LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	HEIGHT	ARM	LIGHT STANDARD
LS-5	3, 5, 1, 3	120'	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION
LS-10	3, 5, 1, 3	120'	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION

ITMS CONDUIT RUN SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
305	1	2.0"	610*	REMOVE EX.(2)#4, EX.(1)#6 GROUND TO REMAIN, INSTALL(2)#2***	EXISTING
306	1	1.5"	25	REMOVE EX.(2)#4, EX.(1)#6 GROUND TO REMAIN, INSTALL(2)#2***	EXISTING
307	1	1.5"	678*	REMOVE EX.(2)#4, EX.(1)#6 GROUND TO REMAIN, INSTALL(2)#2***	EXISTING

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
*** DENOTES CONDUIT AND CABLES INSTALLED BY DELDOT FORCES.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.

LIGHTING SERVICE SCHEDULE

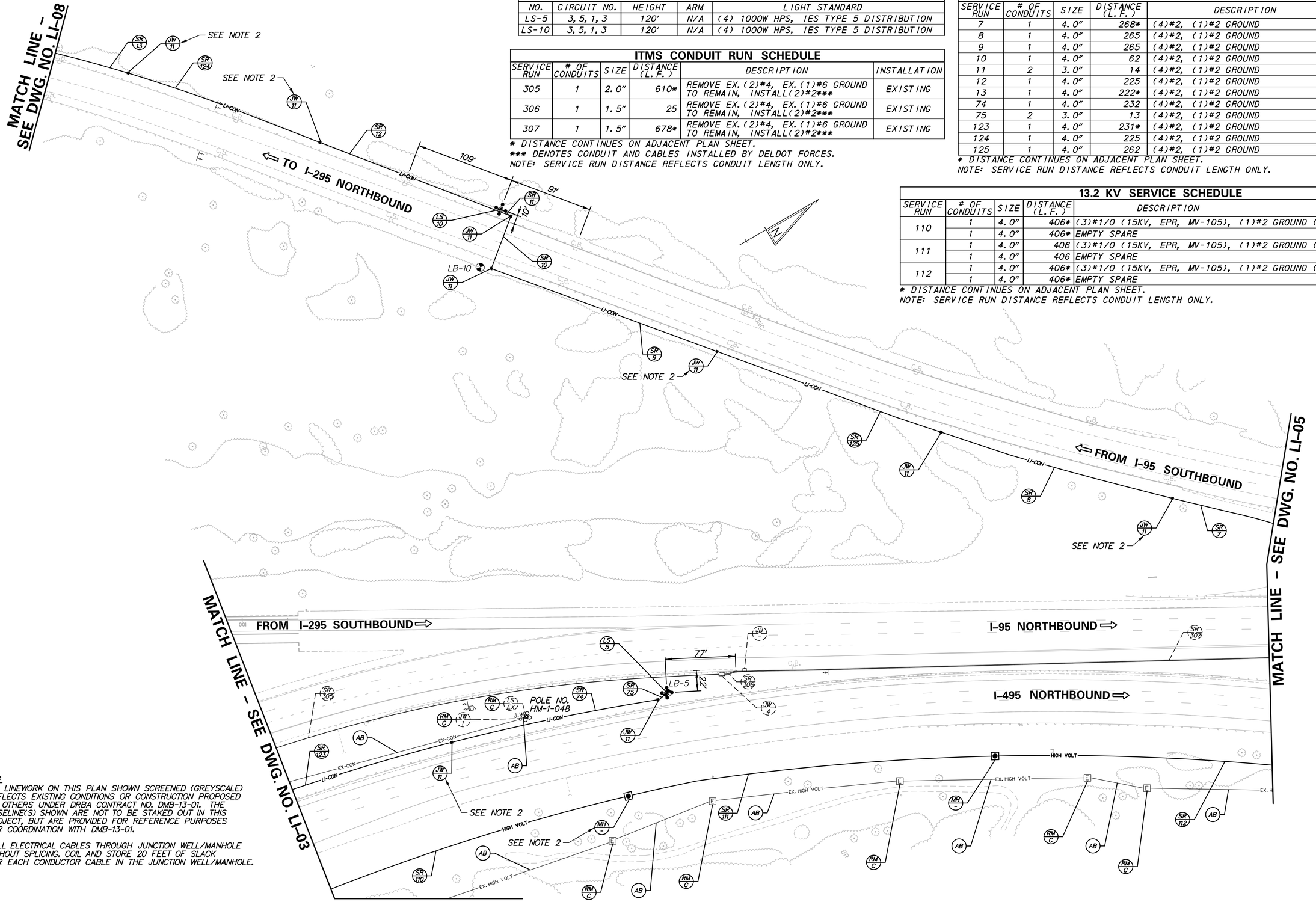
SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
7	1	4.0"	268*	(4)#2, (1)#2 GROUND	TRENCH/BORE
8	1	4.0"	265	(4)#2, (1)#2 GROUND	TRENCH
9	1	4.0"	265	(4)#2, (1)#2 GROUND	TRENCH
10	1	4.0"	62	(4)#2, (1)#2 GROUND	BORE
11	2	3.0"	14	(4)#2, (1)#2 GROUND	TRENCH
12	1	4.0"	225	(4)#2, (1)#2 GROUND	TRENCH
13	1	4.0"	222*	(4)#2, (1)#2 GROUND	TRENCH
74	1	4.0"	232	(4)#2, (1)#2 GROUND	TRENCH
75	2	3.0"	13	(4)#2, (1)#2 GROUND	TRENCH
123	1	4.0"	231*	(4)#2, (1)#2 GROUND	TRENCH
124	1	4.0"	225	(4)#2, (1)#2 GROUND	TRENCH
125	1	4.0"	262	(4)#2, (1)#2 GROUND	TRENCH

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.

13.2 KV SERVICE SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
110	1	4.0"	406*	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	TRENCH
	1	4.0"	406*	EMPTY SPARE	TRENCH
111	1	4.0"	406	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	TRENCH
	1	4.0"	406	EMPTY SPARE	TRENCH
112	1	4.0"	406*	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	TRENCH
	1	4.0"	406*	EMPTY SPARE	TRENCH

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.



NOTES:
1. ALL LINEWORK ON THIS PLAN SHOWN SCREENED (GREYSCALE) REFLECTS EXISTING CONDITIONS OR CONSTRUCTION PROPOSED BY OTHERS UNDER DRBA CONTRACT NO. DMB-13-01. THE BASELINE(S) SHOWN ARE NOT TO BE STAKED OUT IN THIS PROJECT, BUT ARE PROVIDED FOR REFERENCE PURPOSES FOR COORDINATION WITH DMB-13-01.
2. PULL ELECTRICAL CABLES THROUGH JUNCTION WELL/MANHOLE WITHOUT SPLICING. COIL AND STORE 20 FEET OF SLACK FOR EACH CONDUCTOR CABLE IN THE JUNCTION WELL/MANHOLE.

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DELAWARE DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS	

SCALE
0 50 100 150
FEET

I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS

CONTRACT	BRIDGE NO.	N/A
T201509002	DESIGNED BY: WRA	
COUNTY	CHECKED BY: WRA	
NEW CASTLE		

LIGHTING PLAN

LI-04
SHEET NO. 7
TOTAL SHTS. 26

LIGHTING SERVICE SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
1**	1	3.0"	16	(4)#4/0, (1)#2 GROUND	TRENCH
2**	1	3.0"	11	(4)#4/0, (1)#2 GROUND	TRENCH
3	4	4.0"	7	(12)#2, (1)#2 GROUND IN 1 CONDUIT (8)#2, (1)#2 GROUND IN 1 CONDUIT 2 CONDUITS ARE SPARES	TRENCH
4	2	4.0"	89	(12)#2, (1)#2 GROUND IN 1 CONDUIT (8)#2, (1)#2 GROUND IN 1 CONDUIT	BORE
5	2	3.0"	87	(4)#2, (1)#2 GROUND	TRENCH
6	1	4.0"	110	(4)#2, (1)#2 GROUND	BORE
7	1	4.0"	268*	(4)#2, (1)#2 GROUND	TRENCH/BORE
15	2	4.0"	247	(8)#2, (1)#2 GROUND IN 1 CONDUIT (8)#2, (1)#2 GROUND IN 1 CONDUIT	TRENCH
16	2	4.0"	251	(8)#2, (1)#2 GROUND IN 1 CONDUIT (8)#2, (1)#2 GROUND IN 1 CONDUIT	TRENCH
17	2	4.0"	122	(8)#2, (1)#2 GROUND IN 1 CONDUIT (8)#2, (1)#2 GROUND IN 1 CONDUIT	BORE
18	1	4.0"	142	(4)#2, (1)#2 GROUND	TRENCH
19	2	3.0"	18	(4)#2, (1)#2 GROUND	TRENCH
20	1	4.0"	284*	(4)#2, (1)#2 GROUND	TRENCH
25	1	4.0"	225	(8)#2, (1)#2 GROUND	BORE
26	1	4.0"	180*	(8)#2, (1)#2 GROUND	TRENCH
37	1	4.0"	233	(8)#2, (1)#2 GROUND	TRENCH
38	1	4.0"	233*	(8)#2, (1)#2 GROUND	TRENCH
126	2	4.0"	194	(8)#2, (1)#2 GROUND IN 1 CONDUIT (8)#2, (1)#2 GROUND IN 1 CONDUIT	TRENCH

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
** GALVANIZED RIGID CONDUIT.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.

NOTES:
1. PULL ELECTRICAL CABLES THROUGH JUNCTION WELL WITHOUT SPLICING. COIL AND STORE 20 FEET OF SLACK FOR EACH CONDUCTOR CABLE IN THE JUNCTION WELL.
2. FOLLOWING ENERGIZATION OF THE NEW 13.2 KV LINE AND DEENERGIZATION OF THE EXISTING 13.2 KV LINE THE CONTRACTOR SHALL REMOVE ALL EXISTING ELECTRICAL VAULTS AND ABANDON ALL EXISTING LINES. THE CONTRACTOR SHALL COORDINATE WITH DELMARVA POWER FOR THE REMOVAL OF THE EXISTING PAD MOUNTED TRANSFORMER.
3. INSTALL ELECTRICAL SERVICE PEDESTAL PER STD. NO. T-17 WITH 277/480Y VAC, 3 PHASE 4 WIRE, 200A ELECTRICAL SERVICE MODIFIED WITH A LINE SIDE DISCONNECT SWITCH WITH VISIBLE BREAK PER DELMARVA STANDARDS. MODIFICATIONS TO THE ELECTRICAL SERVICE PEDESTAL WILL NOT BE MEASURED AND PAID FOR, BUT WILL BE INCIDENTAL TO THE ELECTRIC SERVICE PEDESTAL ITEM.
4. INSTALL CABINET BASE AS PER STD. NO. T-4 WITH 3 INCH AND 4 INCH CONDUIT SWEEPS. INSTALL LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE (NORTH) (SEE DETAIL ON DWG. NO. LI-16). SEE PANEL SCHEDULE AND WIRING DIAGRAM ON DWG. NO. LI-16.

LIGHTING STANDARD SCHEDULE

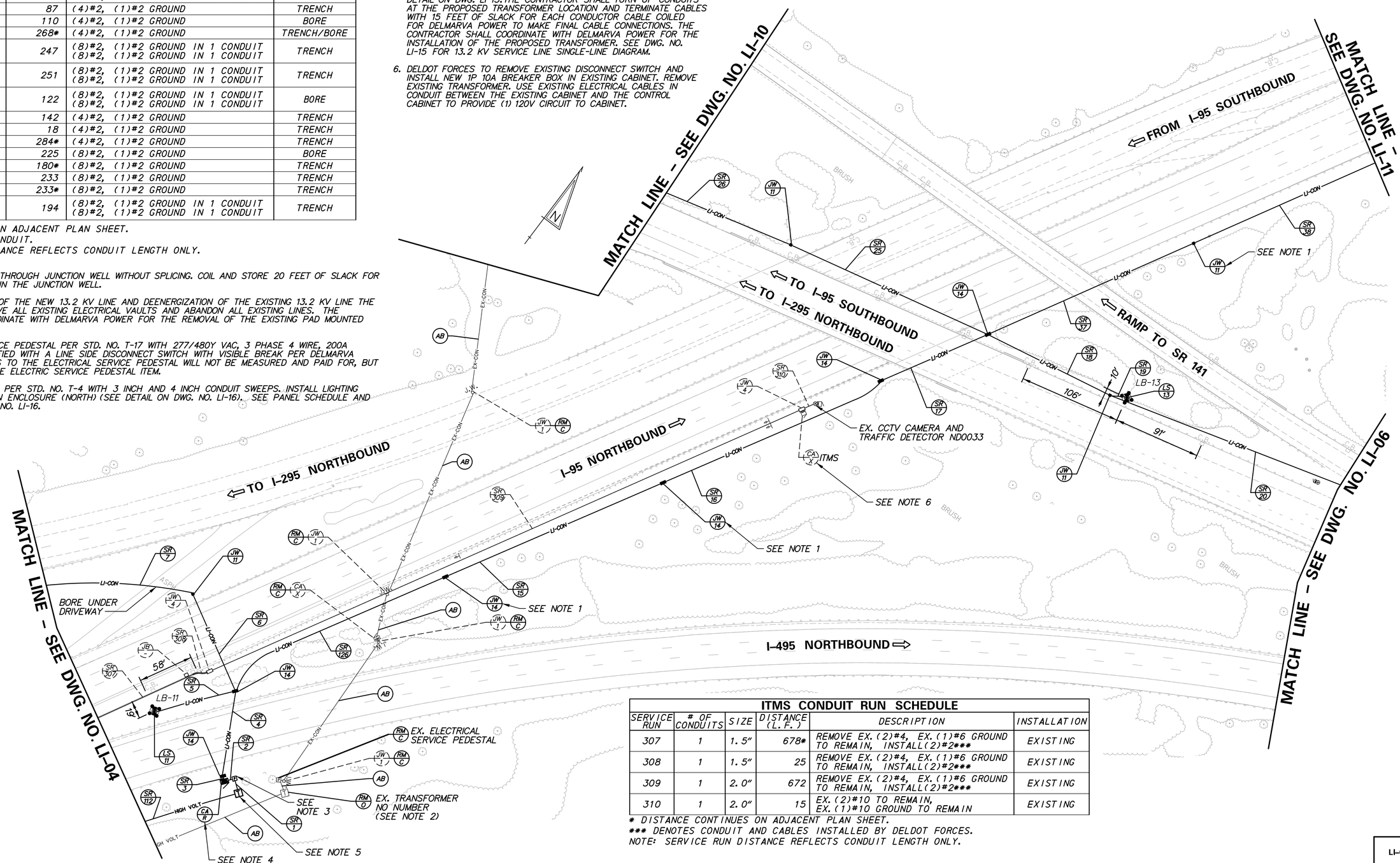
NO.	CIRCUIT NO.	HEIGHT	ARM	LIGHT STANDARD
LS-11	1, 3, 5, 1	120'	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION
LS-13	2, 4, 6, 2	120'	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION

NOTES CONTINUED:
5. THE CONTRACTOR SHALL INSTALL TRANSFORMER PAD THAT IS FURNISHED BY DELMARVA POWER. SEE TRANSFORMER PAD DETAIL ON DWG. LI-15.THE CONTRACTOR SHALL TURN UP CONDUITS AT THE PROPOSED TRANSFORMER LOCATION AND TERMINATE CABLES WITH 15 FEET OF SLACK FOR EACH CONDUCTOR CABLE COILED FOR DELMARVA POWER TO MAKE FINAL CABLE CONNECTIONS. THE CONTRACTOR SHALL COORDINATE WITH DELMARVA POWER FOR THE INSTALLATION OF THE PROPOSED TRANSFORMER. SEE DWG. NO. LI-15 FOR 13.2 KV SERVICE LINE SINGLE-LINE DIAGRAM.
6. DELDOT FORCES TO REMOVE EXISTING DISCONNECT SWITCH AND INSTALL NEW 1P 10A BREAKER BOX IN EXISTING CABINET. REMOVE EXISTING TRANSFORMER. USE EXISTING ELECTRICAL CABLES IN CONDUIT BETWEEN THE EXISTING CABINET AND THE CONTROL CABINET TO PROVIDE (1) 120V CIRCUIT TO CABINET.

13.2 KV SERVICE SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
112	1	4.0"	406*	(3)#1/0 (15KV, EPR, MV-105), (1)#2 GROUND (600V)	TRENCH
	1	4.0"	406*	EMPTY SPARE	TRENCH

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.



ITMS CONDUIT RUN SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
307	1	1.5"	678*	REMOVE EX.(2)#4, EX.(1)#6 GROUND TO REMAIN, INSTALL(2)#2***	EXISTING
308	1	1.5"	25	REMOVE EX.(2)#4, EX.(1)#6 GROUND TO REMAIN, INSTALL(2)#2***	EXISTING
309	1	2.0"	672	REMOVE EX.(2)#4, EX.(1)#6 GROUND TO REMAIN, INSTALL(2)#2***	EXISTING
310	1	2.0"	15	EX.(2)#10 TO REMAIN, EX.(1)#10 GROUND TO REMAIN	EXISTING

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
*** DENOTES CONDUIT AND CABLES INSTALLED BY DELDOT FORCES.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.

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DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE
0 50 100 150
FEET

I-95/I-295/I-495 INTERSTATE
HIGH MAST LIGHTING
IMPROVEMENTS

CONTRACT	T201509002
COUNTY	NEW CASTLE
BRIDGE NO.	N/A
DESIGNED BY:	WRA
CHECKED BY:	WRA

LIGHTING PLAN

LI-05

SHEET NO.	8
TOTAL SHTS.	26

LIGHTING STANDARD SCHEDULE

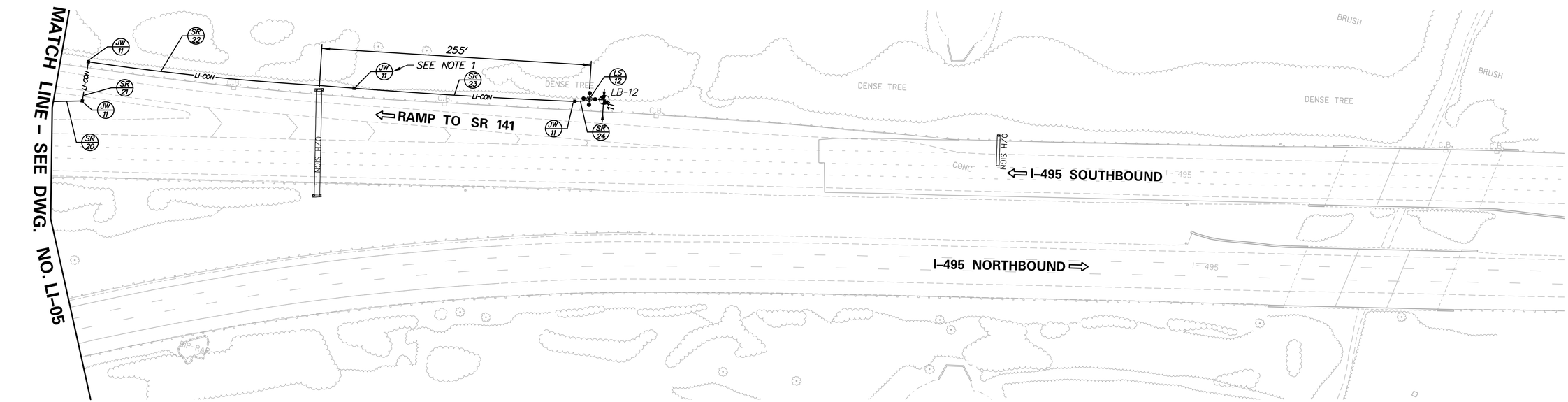
NO.	CIRCUIT NO.	HEIGHT	ARM	LIGHT STANDARD
LS-12	4, 6, 2, 4	120'	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION

LIGHTING SERVICE SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
20	1	4.0"	284*	(4)#2, (1)#2 GROUND	TRENCH
21	1	4.0"	38	(4)#2, (1)#2 GROUND	BORE
22	1	4.0"	253	(4)#2, (1)#2 GROUND	TRENCH
23	1	4.0"	209	(4)#2, (1)#2 GROUND	TRENCH
24	2	3.0"	14	(4)#2, (1)#2 GROUND	TRENCH

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.

NOTES:
1. PULL ELECTRICAL CABLES THROUGH JUNCTION WELL WITHOUT SPLICING. COIL AND STORE 20 FEET OF SLACK FOR EACH CONDUCTOR CABLE IN THE JUNCTION WELL.



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DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE
0 50 100 150
FEET

I-95/I-295/I-495 INTERSTATE
HIGH MAST LIGHTING
IMPROVEMENTS

CONTRACT	BRIDGE NO.	N/A
T201509002	DESIGNED BY: WRA	
COUNTY	CHECKED BY: WRA	
NEW CASTLE		

LIGHTING PLAN

LI-06

SHEET NO.	TOTAL SHTS.
9	26

LIGHTING SERVICE SCHEDULE

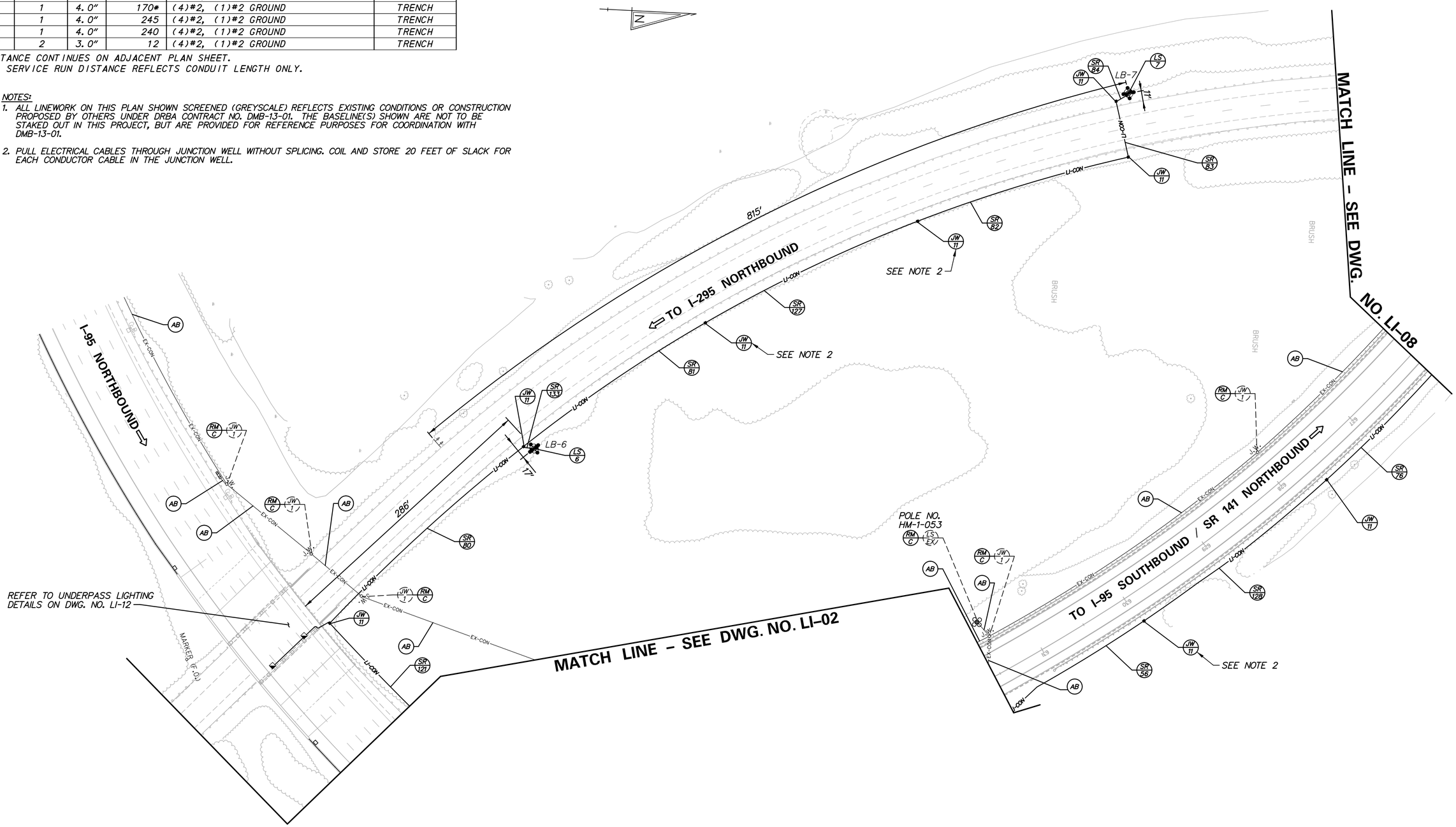
SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
56	1	4.0"	232*	(4)#2, (1)#2 GROUND	TRENCH
76	1	4.0"	243*	(4)#2, (1)#2 GROUND	TRENCH
80	1	4.0"	272	(4)#2, (1)#2 GROUND	TRENCH
81	1	4.0"	229	(4)#2, (1)#2 GROUND	TRENCH
82	1	4.0"	230	(4)#2, (1)#2 GROUND	TRENCH
83	1	4.0"	60	(4)#2, (1)#2 GROUND	BORE
84	2	3.0"	16	(4)#2, (1)#2 GROUND	TRENCH
121	1	4.0"	170*	(4)#2, (1)#2 GROUND	TRENCH
127	1	4.0"	245	(4)#2, (1)#2 GROUND	TRENCH
128	1	4.0"	240	(4)#2, (1)#2 GROUND	TRENCH
133	2	3.0"	12	(4)#2, (1)#2 GROUND	TRENCH

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	HEIGHT	ARM	LIGHT STANDARD
LS-6	7, 9, 11, 7	120'	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION
LS-7	9, 11, 7, 9,	120'	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION

NOTES:
1. ALL LINEWORK ON THIS PLAN SHOWN SCREENED (GREYSCALE) REFLECTS EXISTING CONDITIONS OR CONSTRUCTION PROPOSED BY OTHERS UNDER DRBA CONTRACT NO. DMB-13-01. THE BASELINE(S) SHOWN ARE NOT TO BE STAKED OUT IN THIS PROJECT, BUT ARE PROVIDED FOR REFERENCE PURPOSES FOR COORDINATION WITH DMB-13-01.
2. PULL ELECTRICAL CABLES THROUGH JUNCTION WELL WITHOUT SPLICING. COIL AND STORE 20 FEET OF SLACK FOR EACH CONDUCTOR CABLE IN THE JUNCTION WELL.



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DELAWARE DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE 0 50 100 150 FEET

I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS

CONTRACT	T201509002
COUNTY	NEW CASTLE
BRIDGE NO.	N/A
DESIGNED BY:	WRA
CHECKED BY:	WRA

LIGHTING PLAN

LI-07

SHEET NO.	10
TOTAL SHTS.	26

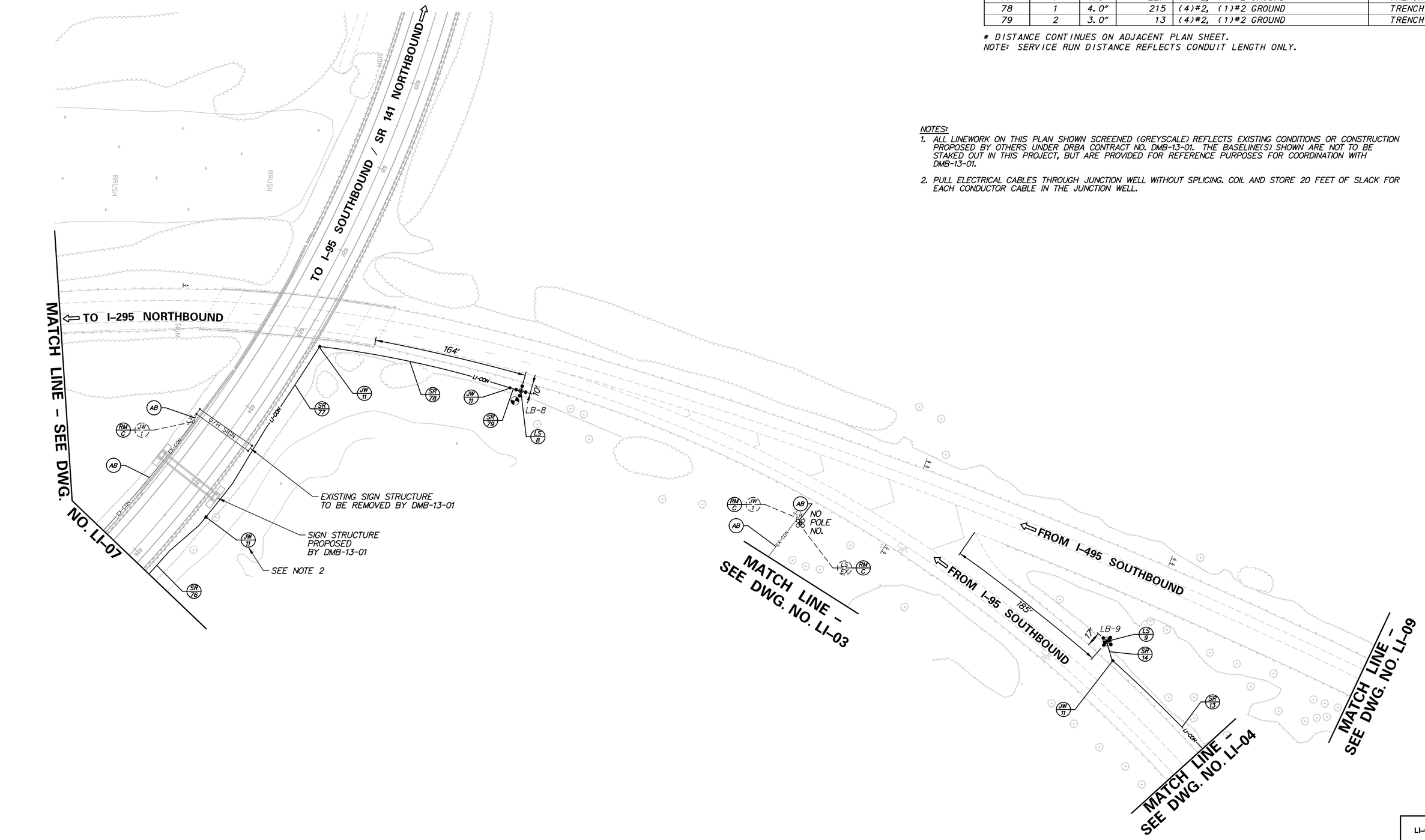
LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	HEIGHT	ARM	LIGHT STANDARD
LS-8	4, 6, 2, 4	120′	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION
LS-9	5, 1, 3, 5	120′	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION

LIGHTING SERVICE SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
13	1	4.0″	222*	(4)#2, (1)#2 GROUND	TRENCH
14	2	3.0″	23	(4)#2, (1)#2 GROUND	TRENCH
76	1	4.0″	243*	(4)#2, (1)#2 GROUND	TRENCH
77	1	4.0″	227	(4)#2, (1)#2 GROUND	TRENCH
78	1	4.0″	215	(4)#2, (1)#2 GROUND	TRENCH
79	2	3.0″	13	(4)#2, (1)#2 GROUND	TRENCH

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.



NOTES:

1. ALL LINEWORK ON THIS PLAN SHOWN SCREENED (GREYSCALE) REFLECTS EXISTING CONDITIONS OR CONSTRUCTION PROPOSED BY OTHERS UNDER DRBA CONTRACT NO. DMB-13-01. THE BASELINE(S) SHOWN ARE NOT TO BE STAKED OUT IN THIS PROJECT, BUT ARE PROVIDED FOR REFERENCE PURPOSES FOR COORDINATION WITH DMB-13-01.
2. PULL ELECTRICAL CABLES THROUGH JUNCTION WELL WITHOUT SPLICING. COIL AND STORE 20 FEET OF SLACK FOR EACH CONDUCTOR CABLE IN THE JUNCTION WELL.

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DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE
0 50 100 150
FEET

I-95/I-295/I-495 INTERSTATE
HIGH MAST LIGHTING
IMPROVEMENTS

CONTRACT	BRIDGE NO. N/A
T201509002	DESIGNED BY: WRA
COUNTY	CHECKED BY: WRA
NEW CASTLE	

LIGHTING PLAN

LI-08	
SHEET NO.	11
TOTAL SHTS.	26

GUARDRAIL SCHEDULE

NO.	ITEM DESCRIPTION / TYPE	OFFSET	LENGTH
GR-3	GUARDRAIL END TREATMENT ATTENUATOR, TYPE 2-31	2.0′+ OFF EDGE OF PAVEMENT	50.00′
GR-4	GALVANIZED STEEL BEAM GUARDRAIL, TYPE 1-31	2.0′ OFF EDGE OF PAVEMENT	225.00′
GR-5	END ANCHORAGE, TYPE 31	2.0′ OFF EDGE OF PAVEMENT	12.50′

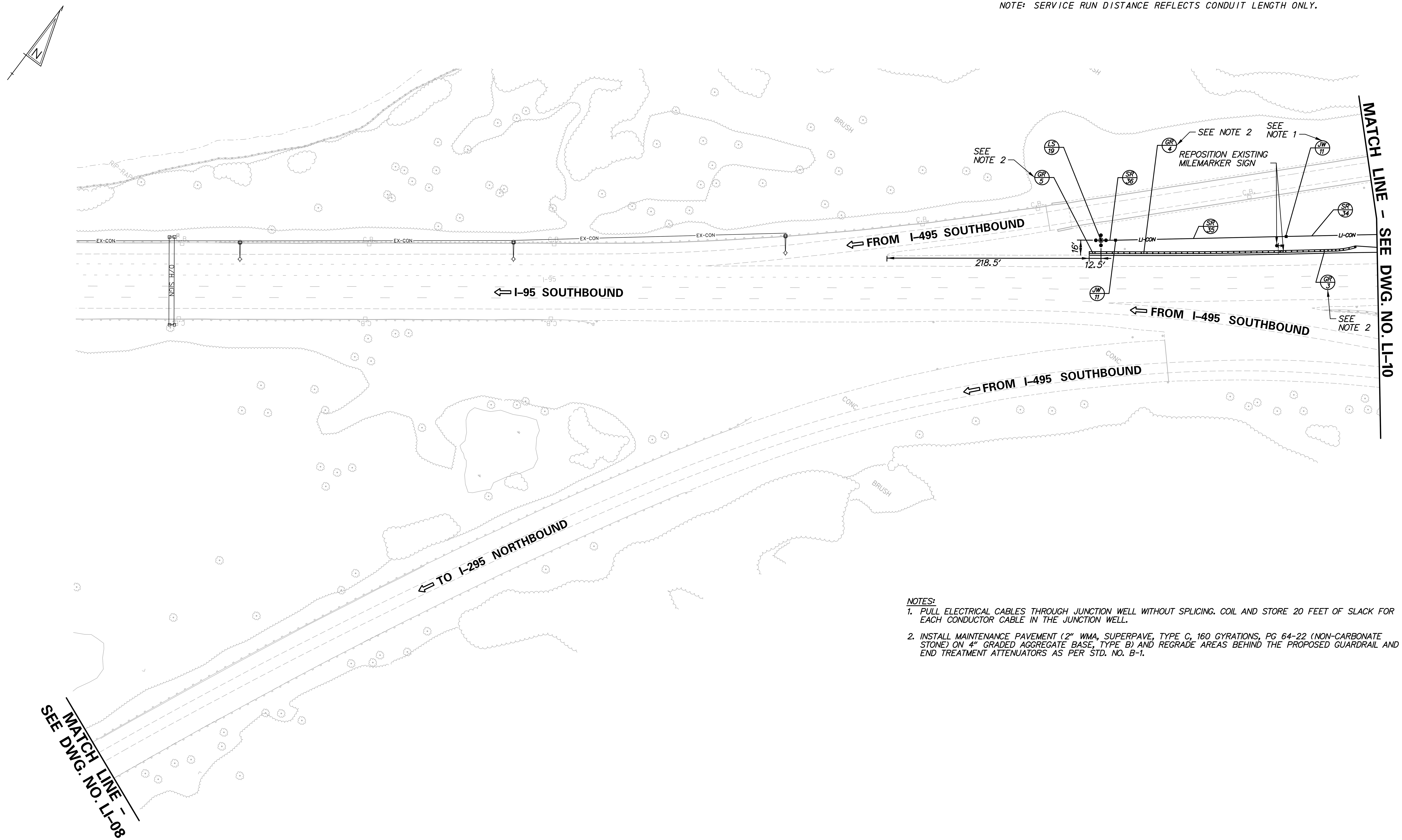
LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	HEIGHT	ARM	LIGHT STANDARD
LS-19	7, 9, 11, 7	120′	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION

LIGHTING SERVICE SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
34	1	4.0″	185*	(4)#2, (1)#2 GROUND	TRENCH
35	1	4.0″	185	(4)#2, (1)#2 GROUND	TRENCH
36	2	3.0″	16	(4)#2, (1)#2 GROUND	TRENCH

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.



NOTES:
1. PULL ELECTRICAL CABLES THROUGH JUNCTION WELL WITHOUT SPLICING. COIL AND STORE 20 FEET OF SLACK FOR EACH CONDUCTOR CABLE IN THE JUNCTION WELL.

2. INSTALL MAINTENANCE PAVEMENT (2″ WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 64-22 (NON-CARBONATE STONE) ON 4″ GRADED AGGREGATE BASE, TYPE B) AND REGRADE AREAS BEHIND THE PROPOSED GUARDRAIL AND END TREATMENT ATTENUATORS AS PER STD. NO. B-1.

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DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 50 100 150 FEET	I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS	CONTRACT T201509002	BRIDGE NO. N/A
				COUNTY NEW CASTLE	DESIGNED BY: WRA
					CHECKED BY: WRA

LIGHTING PLAN

LI-09

SHEET NO. 12

TOTAL SHTS. 26

LIGHTING STANDARD SCHEDULE

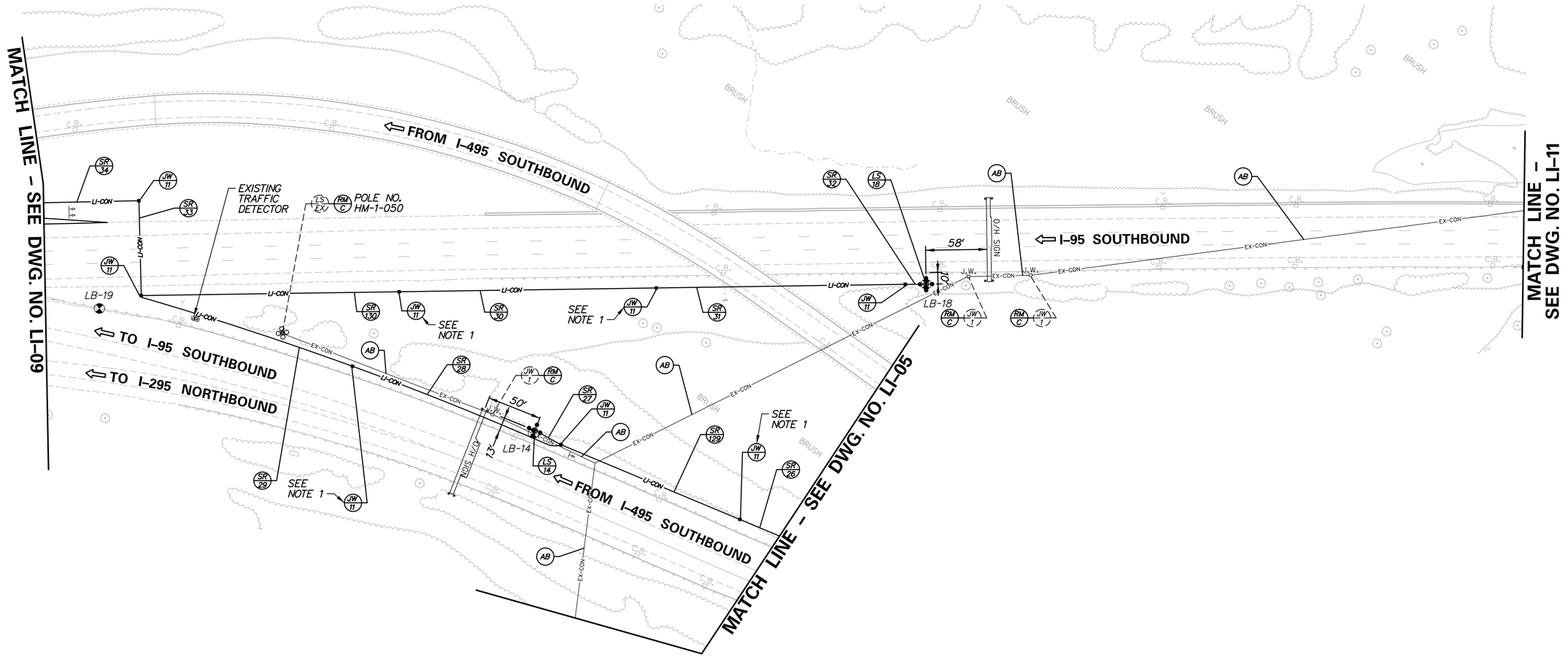
NO.	CIRCUIT NO.	HEIGHT	ARM	LIGHT STANDARD
LS-14	8, 10, 12, 8	120'	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION
LS-18	9, 11, 7, 9	120'	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION

NOTES:
1. PULL ELECTRICAL CABLES THROUGH JUNCTION WELL WITHOUT SPLICING. COIL AND STORE 20 FEET OF SLACK FOR EACH CONDUCTOR CABLE IN THE JUNCTION WELL.

LIGHTING SERVICE SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
26	1	4.0"	180*	(8)#2, (1)#2 GROUND	TRENCH
27	2	3.0"	28	(4)#2, (1)#2 GROUND	TRENCH
28	1	4.0"	203	(4)#2, (1)#2 GROUND	TRENCH
29	1	4.0"	202	(4)#2, (1)#2 GROUND	TRENCH
30	1	4.0"	233	(4)#2, (1)#2 GROUND	TRENCH
31	1	4.0"	226	(4)#2, (1)#2 GROUND	TRENCH
32	2	3.0"	19	(4)#2, (1)#2 GROUND	TRENCH
33	1	4.0"	86	(4)#2, (1)#2 GROUND	BORE
34	1	4.0"	185*	(4)#2, (1)#2 GROUND	TRENCH
129	1	4.0"	176	(8)#2, (1)#2 GROUND	TRENCH
130	1	4.0"	234	(4)#2, (1)#2 GROUND	TRENCH

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.



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DELAWARE DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE 0 50 100 150 FEET

I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS

CONTRACT	BRIDGE NO.	N/A
T201509002	DESIGNED BY: WRA	
COUNTY	CHECKED BY: WRA	
NEW CASTLE		

LIGHTING PLAN

LI-10

SHEET NO.	13
TOTAL SHTS.	26

GUARDRAIL SCHEDULE

NO.	ITEM DESCRIPTION / TYPE	OFFSET	LENGTH
GR-6	GUARDRAIL END TREATMENT ATTENUATOR, TYPE 2-31	9.0' + OFF EDGE OF PAVEMENT	50.00'
GR-7	GALVANIZED STEEL BEAM GUARDRAIL, TYPE 1-31	VARIES, 3.0'-9.0' OFF EDGE OF PAVEMENT	75.00'

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	HEIGHT	ARM	LIGHT STANDARD
LS-15	15, 17, 13, 15	120'	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION
LS-16	13, 15, 17, 13	120'	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION
LS-17	10, 12, 8, 10	120'	N/A	(4) 1000W HPS, IES TYPE 5 DISTRIBUTION

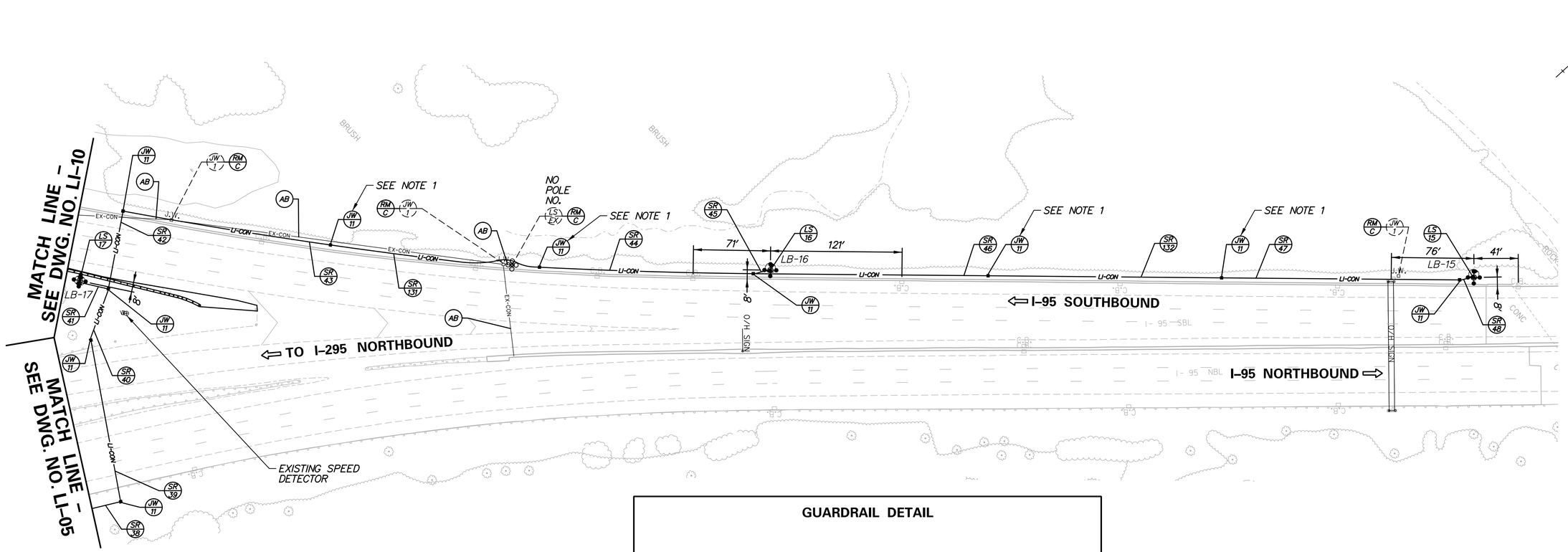
NOTES:

1. PULL ELECTRICAL CABLES THROUGH JUNCTION WELL WITHOUT SPLICING. COIL AND STORE 20 FEET OF SLACK FOR EACH CONDUCTOR CABLE IN THE JUNCTION WELL.
2. INSTALL MAINTENANCE PAVEMENT (2" WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 64-22 (NON-CARBONATE STONE) ON 4" GRADED AGGREGATE BASE, TYPE B) AND REGRADE AREAS BEHIND THE PROPOSED GUARDRAIL AND END TREATMENT ATTENUATORS AS PER STD. NO. B-1.
3. REMOVE THE EXISTING GUARDRAIL END TREATMENT AND GUARDRAIL AS SHOWN ON THE PLANS.
4. TIE AND TRANSITION PROPOSED TYPE 1-31 GUARDRAIL INTO THE EXISTING TYPE 1-27 GUARDRAIL PER STD. NO. B-7.

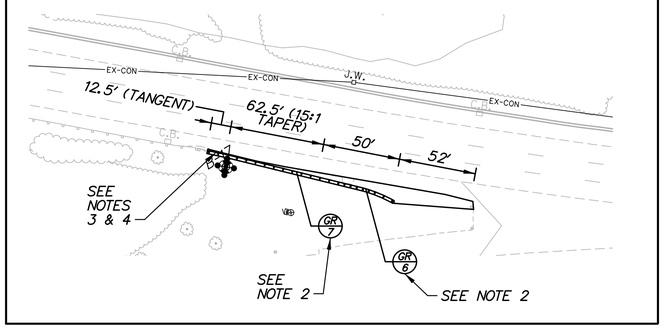
LIGHTING SERVICE SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
38	1	4.0"	235*	(8)#2, (1)#2 GROUND	TRENCH
39	1	4.0"	152	(8)#2, (1)#2 GROUND	BORE
40	1	4.0"	50	(8)#2, (1)#2 GROUND	TRENCH
41	2	3.0"	28	(4)#2, (1)#2 GROUND	TRENCH
42	1	4.0"	73	(4)#2, (1)#2 GROUND	BORE
43	1	4.0"	194	(4)#2, (1)#2 GROUND	TRENCH
44	1	4.0"	198	(4)#2, (1)#2 GROUND	TRENCH
45	2	3.0"	17	(4)#2, (1)#2 GROUND	TRENCH
46	1	4.0"	217	(4)#2, (1)#2 GROUND	TRENCH
47	1	4.0"	219	(4)#2, (1)#2 GROUND	TRENCH
48	2	3.0"	14	(4)#2, (1)#2 GROUND	TRENCH
131	1	4.0"	195	(4)#2, (1)#2 GROUND	TRENCH
132	1	4.0"	216	(4)#2, (1)#2 GROUND	TRENCH

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.



GUARDRAIL DETAIL



DELAWARE DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE 0 50 100 150 FEET

I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS

CONTRACT	T201509002
COUNTY	NEW CASTLE
BRIDGE NO.	N/A
DESIGNED BY:	WRA
CHECKED BY:	WRA

LIGHTING PLAN

LI-11	
SHEET NO.	14
TOTAL SHTS.	26

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NOTES:

1. ALL UNDERPASS LUMINAIRES, CONDUIT, STRAPS AND JUNCTION BOXES SHALL BE ATTACHED TO CONCRETE STRUCTURES USING 1/4" STAINLESS STEEL WEDGE ANCHORS WITH A MINIMUM EMBEDMENT OF 2" AND A MINIMUM TENSILE PULLOUT STRENGTH OF 500 LBS. THE COST OF THE ANCHOR BOLTS WILL NOT BE MEASURED AND PAID FOR BUT WILL BE INCIDENTAL TO OTHER NEGOTIABLE ITEMS IN THE CONTRACT.
2. CONDUITS MOUNTED TO BRIDGE STRUCTURE SHALL BE 1" DIAMETER GALVANIZED RIGID CONDUIT, UNLESS OTHERWISE NOTED.
3. ALL CONDUITS MOUNTED TO THE BRIDGE STRUCTURE SHALL BE SUPPORTED BY 2 HOLE STAINLESS STEEL CONDUIT STRAPS OR CLAMPS SPACED AT A MAXIMUM DISTANCE OF 5'-0" BETWEEN SUPPORTS. CONDUITS SHALL ALSO BE SUPPORTED WITHIN 1'-0" OF EACH JUNCTION BOX, CONDULET OR LUMINAIRE.
4. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS OF ALL PROPOSED UNDERPASS LIGHTING SYSTEM COMPONENTS INCLUDING CONDUIT, CONDUIT STRAPS AND CLAMPS, JUNCTION BOXES, BENDS, CONDULETS, EXPANSION COUPLINGS AND UNDERPASS LUMINAIRES TO THE ENGINEER FOR APPROVAL. SHOP DRAWING PREPARATION SHALL BE INCIDENTAL TO THE PERTINENT ITEMS IN THE CONTRACT.
5. ALL CONDUIT STRAPS, CLAMPS, WEDGE ANCHORS AND CONDULETS WILL NOT BE MEASURED AND PAID FOR BUT WILL BE INCIDENTAL TO THE PERTINENT ITEMS IN THE CONTRACT.
6. SEE DRAWING NOS. LI-02 AND LI-07 FOR SERVICE RUN CONNECTION TO THE UNDERPASS LIGHTING SYSTEM.
7. ALL LINEWORK ON THIS PLAN SHOWN SCREENED (GREYSCALE) REFLECTS EXISTING CONDITIONS OR CONSTRUCTION PROPOSED BY OTHERS UNDER DRBA CONTRACT NO. DMB-13-01. THE BASELINE(S) SHOWN ARE NOT TO BE STAKED OUT IN THIS PROJECT, BUT ARE PROVIDED FOR REFERENCE PURPOSES FOR COORDINATION WITH DMB-13-01.
8. REPAIR MAINTENANCE PAVEMENT BETWEEN THE BACK SIDE OF THE CONCRETE BARRIER/GUARDRAIL AND THE BRIDGE SLOPE PROTECTION THAT IS IMPACTED BY CONDUIT INSTALLATION. REPLACE WITH 2" WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 64-22 (NON-CARBONATE STONE) ON 4" GRADED AGGREGATE BASE, TYPE B.

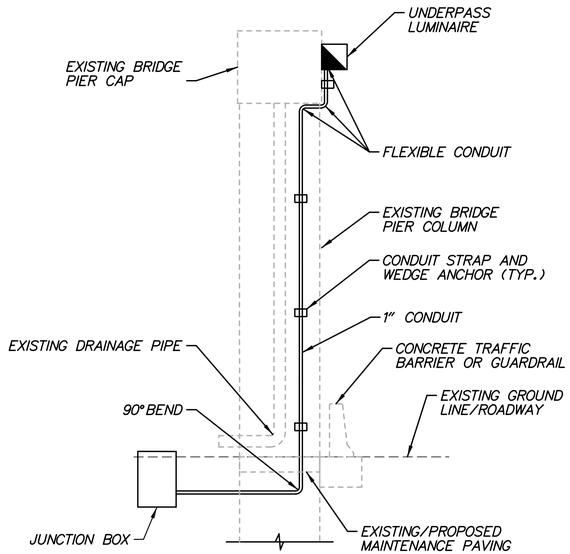
LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	HEIGHT	ARM	LIGHT STANDARD
LS-33	7	15'	N/A	100W HPS, IES TYPE 4 DISTRIBUTION
LS-34	11	20'	N/A	100W HPS, IES TYPE 4 DISTRIBUTION
LS-35	12	13'	N/A	100W HPS, IES TYPE 4 DISTRIBUTION
LS-36	10	18'	N/A	100W HPS, IES TYPE 4 DISTRIBUTION
LS-37	8	13'	N/A	100W HPS, IES TYPE 4 DISTRIBUTION
LS-38	12	18'	N/A	100W HPS, IES TYPE 4 DISTRIBUTION

LIGHTING SERVICE SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
90**	1	1.0"	60	(3)#10, (1)#10 GROUND	TRENCH/ON STRUCTURE
91**	1	1.0"	45	(2)#10, (1)#10 GROUND	ON STRUCTURE
92**	1	1.0"	60	(3)#10, (1)#10 GROUND	TRENCH/ON STRUCTURE
93**	1	1.0"	48	(2)#10, (1)#10 GROUND	ON STRUCTURE
94**	1	1.0"	60	(3)#10, (1)#10 GROUND	TRENCH/ON STRUCTURE
95**	1	1.0"	52	(2)#10, (1)#10 GROUND	ON STRUCTURE

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
** GALVANIZED RIGID CONDUIT.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.



SECTION A'-A'
NOT TO SCALE

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DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE
0 20 40 60
FEET

I-95/I-295/I-495 INTERSTATE
HIGH MAST LIGHTING
IMPROVEMENTS

CONTRACT	BRIDGE NO.	N/A
T201509002	DESIGNED BY: WRA	
COUNTY	CHECKED BY: WRA	
NEW CASTLE		

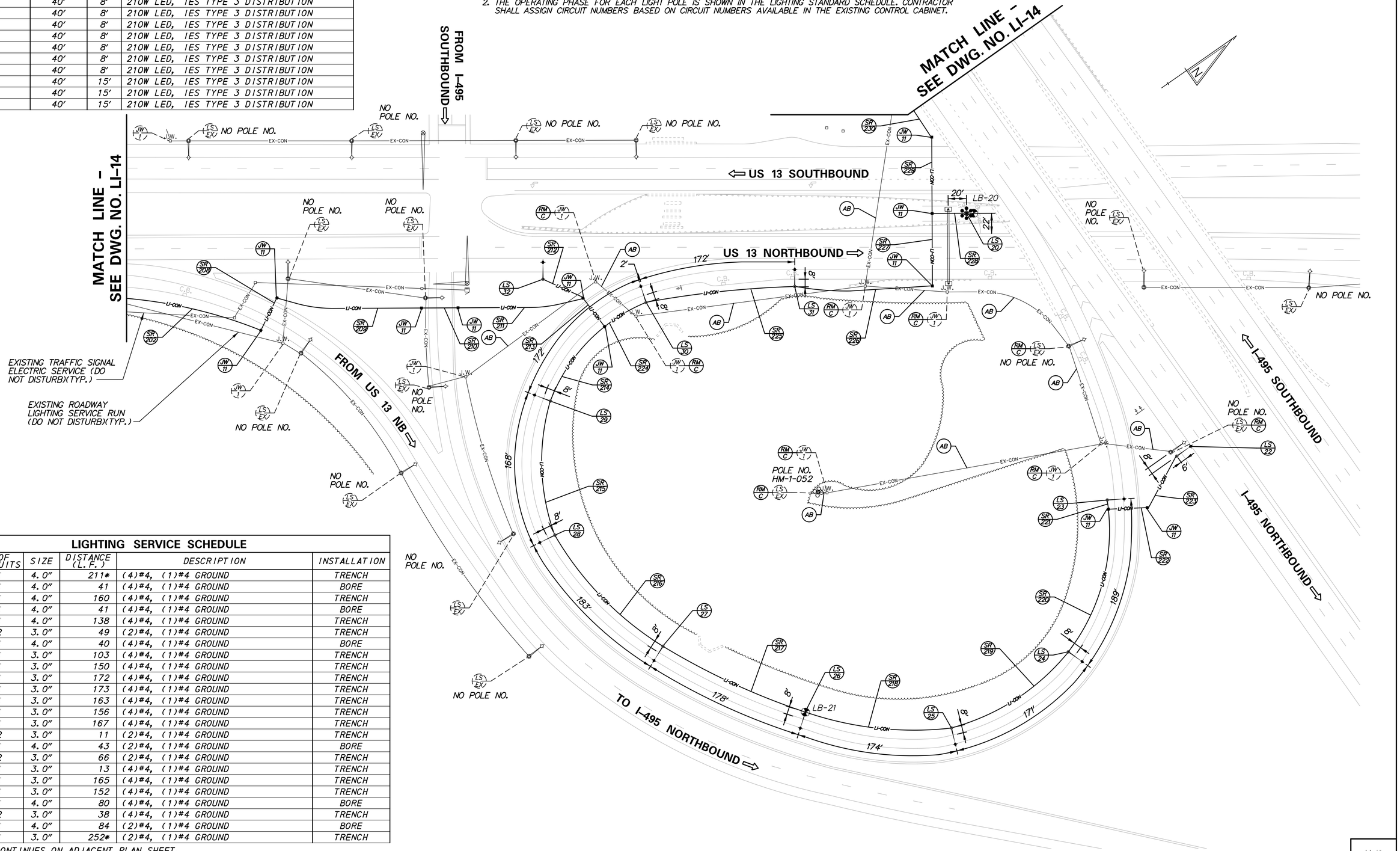
LIGHTING DETAILS

LI-12
SHEET NO. 15
TOTAL SHTS. 26

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	HEIGHT	ARM	LIGHT STANDARD
LS-20	A, B, A, B, A, B	120'	N/A	(6) 376W LED, IES TYPE 5 DISTRIBUTION
LS-22	B	40'	15'	315W LED, IES TYPE 3 DISTRIBUTION
LS-23	A	40'	8'	210W LED, IES TYPE 3 DISTRIBUTION
LS-24	B	40'	8'	210W LED, IES TYPE 3 DISTRIBUTION
LS-25	A	40'	8'	210W LED, IES TYPE 3 DISTRIBUTION
LS-26	B	40'	8'	210W LED, IES TYPE 3 DISTRIBUTION
LS-27	A	40'	8'	210W LED, IES TYPE 3 DISTRIBUTION
LS-28	B	40'	8'	210W LED, IES TYPE 3 DISTRIBUTION
LS-29	A	40'	8'	210W LED, IES TYPE 3 DISTRIBUTION
LS-30	B	40'	15'	210W LED, IES TYPE 3 DISTRIBUTION
LS-31	A	40'	15'	210W LED, IES TYPE 3 DISTRIBUTION
LS-32	A	40'	15'	210W LED, IES TYPE 3 DISTRIBUTION

NOTES:
1. ALL PROPOSED 40 FOOT HEIGHT LIGHT POLES SHALL BE INSTALLED ON TYPE 6 POLE BASES WITH A POLE BASE EXTENSION PROVIDING AN ADDITIONAL 2 FEET IN DEPTH BELOW GRADE FOR THE FOUNDATION (8 FOOT DEPTH TOTAL).
2. THE OPERATING PHASE FOR EACH LIGHT POLE IS SHOWN IN THE LIGHTING STANDARD SCHEDULE. CONTRACTOR SHALL ASSIGN CIRCUIT NUMBERS BASED ON CIRCUIT NUMBERS AVAILABLE IN THE EXISTING CONTROL CABINET.



LIGHTING SERVICE SCHEDULE

SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
202	1	4.0"	211*	(4)#4, (1)#4 GROUND	TRENCH
208	1	4.0"	41	(4)#4, (1)#4 GROUND	BORE
209	1	4.0"	160	(4)#4, (1)#4 GROUND	TRENCH
210	1	4.0"	41	(4)#4, (1)#4 GROUND	BORE
211	1	4.0"	138	(4)#4, (1)#4 GROUND	TRENCH
212	2	3.0"	49	(2)#4, (1)#4 GROUND	TRENCH
213	1	4.0"	40	(4)#4, (1)#4 GROUND	BORE
214	1	3.0"	103	(4)#4, (1)#4 GROUND	TRENCH
215	1	3.0"	150	(4)#4, (1)#4 GROUND	TRENCH
216	1	3.0"	172	(4)#4, (1)#4 GROUND	TRENCH
217	1	3.0"	173	(4)#4, (1)#4 GROUND	TRENCH
218	1	3.0"	163	(4)#4, (1)#4 GROUND	TRENCH
219	1	3.0"	156	(4)#4, (1)#4 GROUND	TRENCH
220	1	3.0"	167	(4)#4, (1)#4 GROUND	TRENCH
221	2	3.0"	11	(2)#4, (1)#4 GROUND	TRENCH
222	1	4.0"	43	(2)#4, (1)#4 GROUND	BORE
223	2	3.0"	66	(2)#4, (1)#4 GROUND	TRENCH
224	1	3.0"	13	(4)#4, (1)#4 GROUND	TRENCH
225	1	3.0"	165	(4)#4, (1)#4 GROUND	TRENCH
226	1	3.0"	152	(4)#4, (1)#4 GROUND	TRENCH
227	1	4.0"	80	(4)#4, (1)#4 GROUND	BORE
228	2	3.0"	38	(4)#4, (1)#4 GROUND	TRENCH
229	1	4.0"	84	(2)#4, (1)#4 GROUND	BORE
230	1	3.0"	252*	(2)#4, (1)#4 GROUND	TRENCH

* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.

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DELAWARE DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE 0 50 100 150 FEET

I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS

CONTRACT	T201509002
COUNTY	NEW CASTLE
BRIDGE NO.	N/A
DESIGNED BY:	WRA
CHECKED BY:	WRA

LIGHTING PLAN

LI-13	
SHEET NO.	16
TOTAL SHTS.	26

LIGHTING SERVICE SCHEDULE

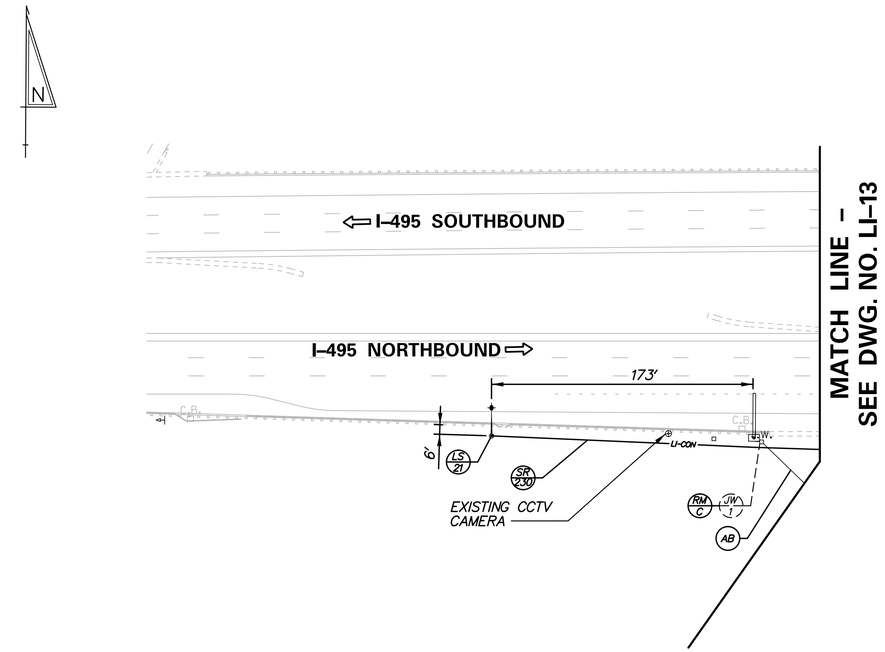
SERVICE RUN	# OF CONDUITS	SIZE	DISTANCE (L.F.)	DESCRIPTION	INSTALLATION
200	1	4.0"	210	(4)#4, (1)#4 GROUND	TRENCH
201	1	4.0"	210	(4)#4, (1)#4 GROUND	TRENCH
202	1	4.0"	211*	(4)#4, (1)#4 GROUND	TRENCH
230	1	3.0"	252*	(2)#4, (1)#4 GROUND	TRENCH

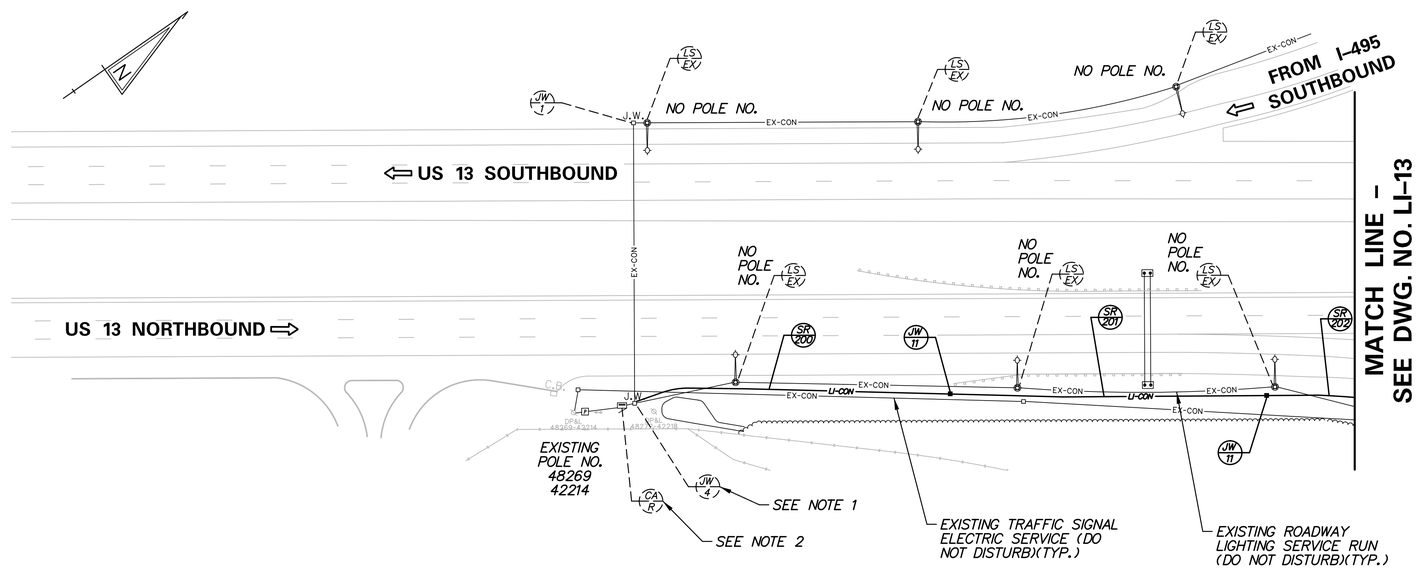
* DISTANCE CONTINUES ON ADJACENT PLAN SHEET.
NOTE: SERVICE RUN DISTANCE REFLECTS CONDUIT LENGTH ONLY.

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	HEIGHT	ARM	LIGHT STANDARD
LS-21	A	40'	15'	315W LED, IES TYPE 3 DISTRIBUTION

NOTES:
1. REPAIR EXISTING JUNCTION WELL.
2. THE CONTRACTOR SHALL USE THE EXISTING CABINET AND INSTALL (2) 1P CIRCUIT BREAKERS IN THE EXISTING PANEL TO OPERATE THE PROPOSED LIGHT POLES. MODIFICATIONS TO THE EXISTING CABINET WILL NOT BE MEASURED AND PAID FOR, BUT WILL BE INCIDENTAL TO THE OVERALL CONTRACT.
3. ALL PROPOSED 40 FOOT HEIGHT LIGHT POLES SHALL BE INSTALLED ON TYPE 6 POLE BASES WITH A POLE BASE EXTENSION PROVIDING AN ADDITIONAL 2 FEET IN DEPTH BELOW GRADE FOR THE FOUNDATION (8 FOOT DEPTH TOTAL).
4. THE OPERATING PHASE FOR EACH LIGHT POLE IS SHOWN IN THE LIGHTING STANDARD SCHEDULE. CONTRACTOR SHALL ASSIGN CIRCUIT NUMBERS BASED ON CIRCUIT NUMBERS AVAILABLE IN THE EXISTING CONTROL CABINET.





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DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS	

SCALE
0 50 100 150
FEET

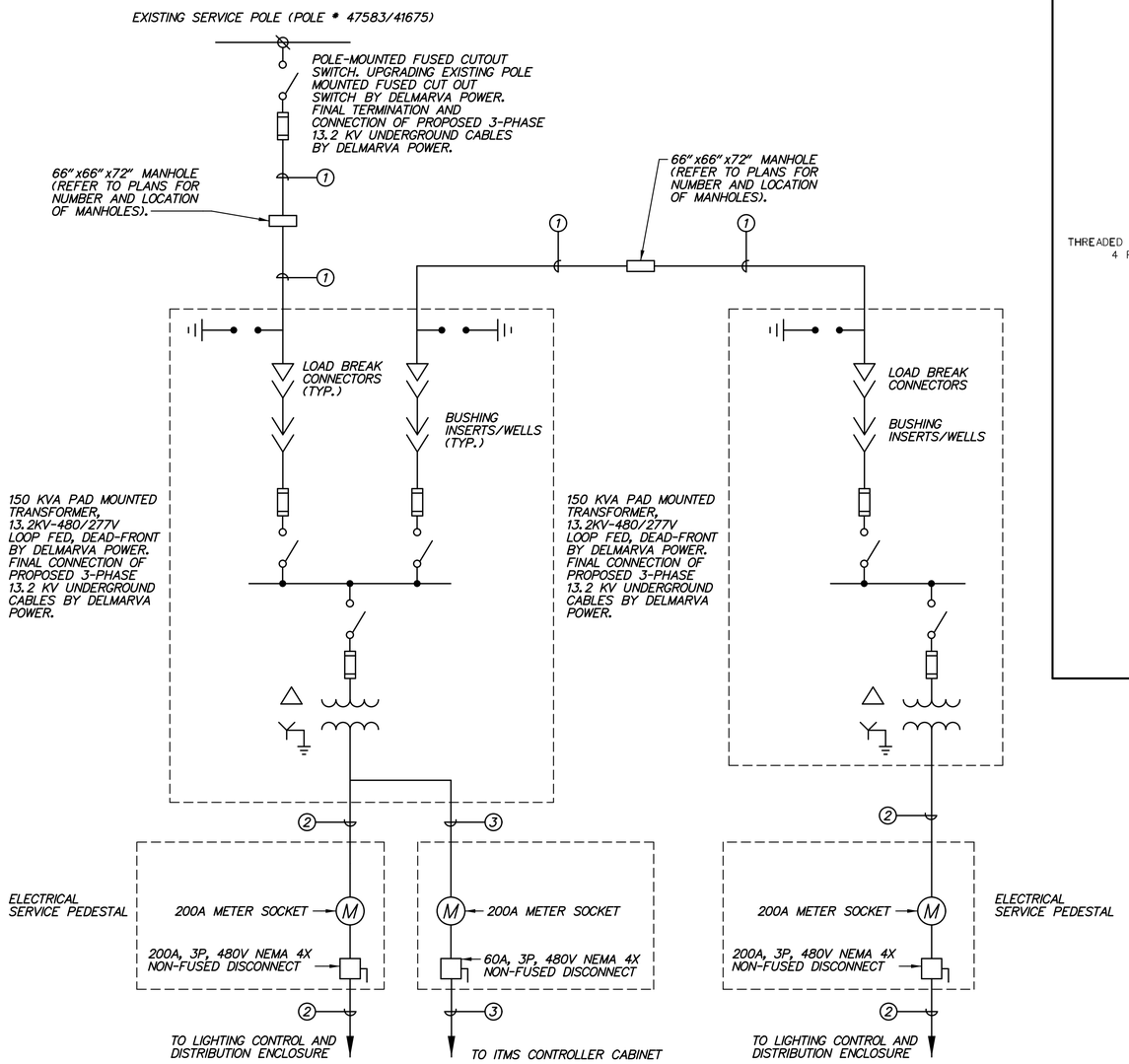
I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS

CONTRACT	BRIDGE NO.	N/A
T201509002	DESIGNED BY: WRA	
COUNTY	CHECKED BY: WRA	
NEW CASTLE		

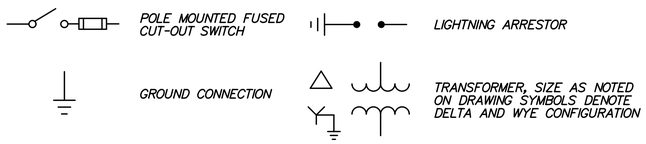
LIGHTING PLAN

LI-14
SHEET NO. 17
TOTAL SHTS. 26

13.2 KV SERVICE LINE SINGLE-LINE DIAGRAM



SINGLE LINE DIAGRAM SYMBOLS

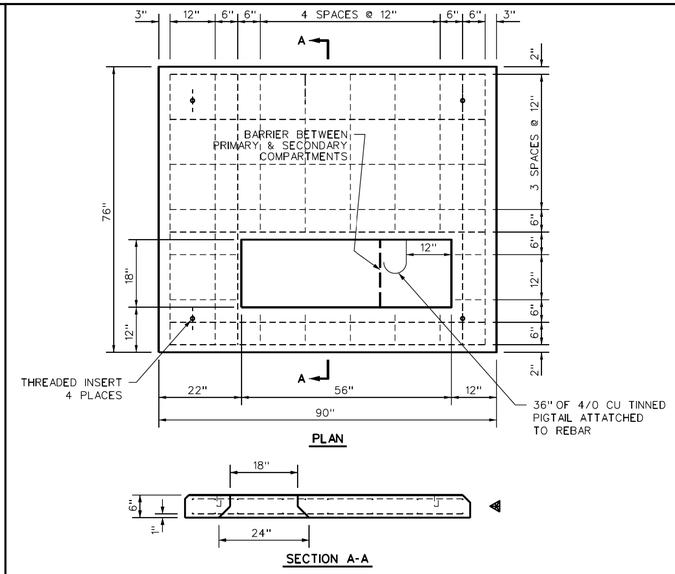


FEEDER SCHEDULE:

(1) (2) 4-INCH PVC CONDUITS WITH ONE CONTAINING (3) #2 (15KV, EPR, MV-105) CONDUCTORS AND (1) #2 GROUND (600V) AND ONE CONDUIT USED AS A SPARE

(2) (1) 3-INCH RGS CONDUIT WITH (4) #4/0 CONDUCTORS AND (1) #2 GROUND

(3) (1) 2-INCH RGS CONDUIT WITH (4) #2 CONDUCTORS AND (1) #6 GROUND



NOTE:
PICK-UP, TRANSPORTATION, AND INSTALLATION OF PAD MOUNTED TRANSFORMERS AS INDICATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER WILL NOT BE MEASURED AND PAID FOR SEPARATELY, BUT WILL BE INCIDENTAL TO THE OVERALL CONTRACT.

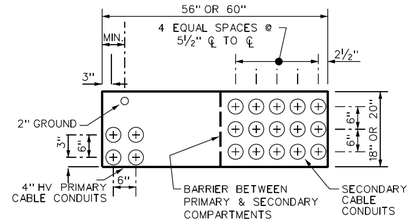
90"x76" TRANSFORMER PAD DETAIL

PRE-CAST CONCRETE PAD

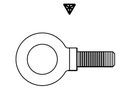
INSTALLATION DETAILS

1. Pad shall be set on a minimum 6" thick crushed stone bed (max. stone size shall be 1") and the top of the pad should be 3" above ground level.
2. The soil beneath the crushed stone shall be well compacted.
3. Top of the conduit should be 2" above the surface of the pad.
4. Pad and transformer must be set so that the slope shall not exceed 3° to prevent the possibility of internal flashover. (½" / 12")
5. When pad is installed in traffic area (parking lot, etc.) appropriate protective barriers must be installed. (See Z-579)
6. Each of the 4 inserts is properly rated and will accept a 1"-8 UNC heavy duty eyebolt with shoulder (Chicago #30 or equivalent).
7. These pads are not stocked and must be ordered by reservation.
8. Approximate lifting weights: 0112-2852 - 3,200 lbs.
   0132-6974 - 3,800 lbs.
   0132-6982 - 5,300 lbs.
9. See Z-805 for grounding details.

REBAR SCHEDULE SIZE	REBAR SCHEDULE SPACING	CONCRETE MIX 4000 PSI CU. FT.	PAD SIZE	PRECAST PAD STOCK NO.	COMPATIBLE UNIT DESIGNATION	TRANSMISSION SIZE (kV)	TRANSMISSION SIZE (kVA)
#4	12" C.C.	20	7'-6" X 6'-4"	0112-2852	3PMTPAD-A	15 25	75-500 75-500
#4	12" C.C.	25	7'-6" X 7'-6"	0132-6974	3PMTPAD-B	15 25 35	750-1500 750-2500 75-1000
#4	12" C.C.	35	8'-10" X 8'-5"	0132-6982	3PMTPAD-C	15 35 ALL STEPDOWN	2000-2500 1500-2500 75-1000

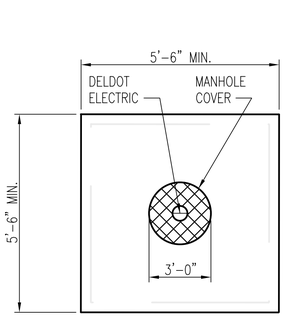


CONDUIT OPENING FOR PRECAST PADS
TYPICAL DUCT DETAILS

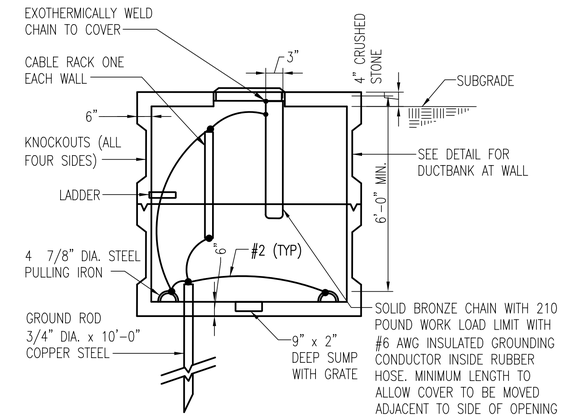


1"-8 UNC
HEAVY DUTY EYEBOLT
SEE NOTE 6

PRECAST ELECTRICAL MANHOLE DETAIL



PLAN



SECTION

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DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS	

NOT TO SCALE

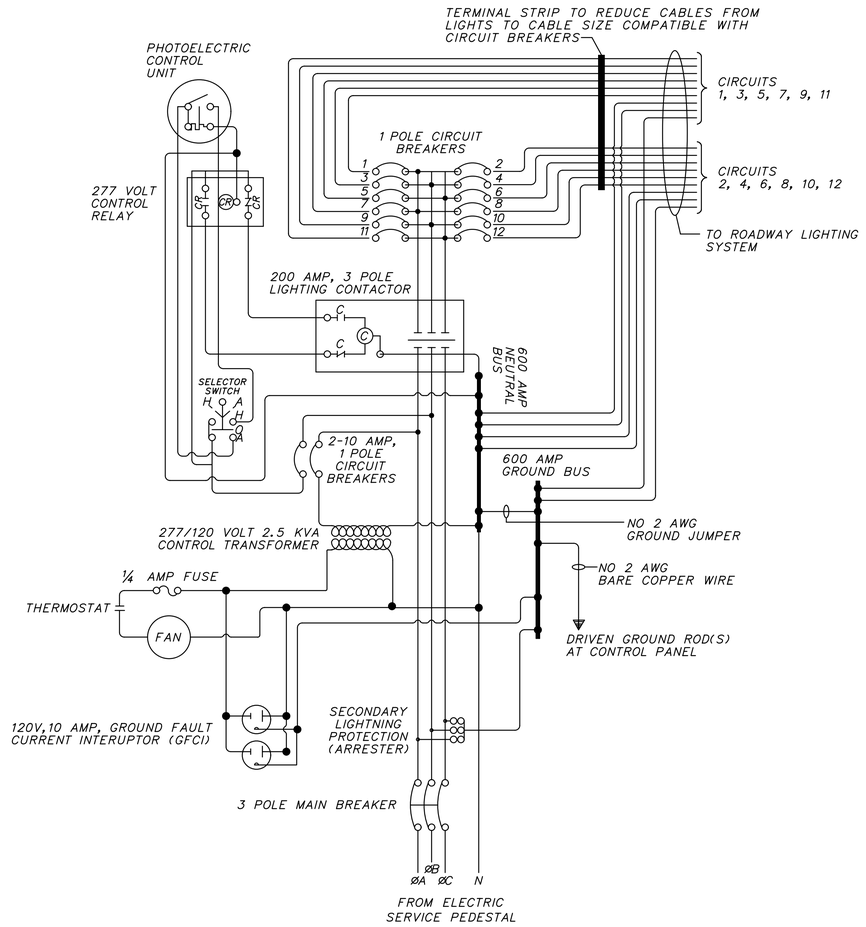
I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS

CONTRACT	BRIDGE NO.	N/A
T201509002	DESIGNED BY: WRA	
COUNTY	CHECKED BY: WRA	
NEW CASTLE		

LIGHTING DETAILS

LI-15	
SHEET NO.	18
TOTAL SHTS.	26

LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE WIRING DIAGRAM



NOTES:

1. ALL WIRING FROM SERVICE FEEDS SHALL BE INSTALLED IN FLEXIBLE CONDUIT WITHIN THE LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE.
2. NO CONDUCTORS MAY ENTER OR EXIT THROUGH THE REAR OF ANY PANEL.
3. THE LIGHTING CONTACTOR SHALL BE IN A PROPERLY SIZED ENCLOSURE.
4. A CONTINUOUS GROUNDING CONDUCTOR SHALL BE INSTALLED FROM THE METER PEDESTAL DISCONNECT SWITCH THROUGH ALL PANELS, THEN TO THE GROUNDING ELECTRODE.
5. ALL CONDUCTORS NOT IN CONDUIT SHALL BE BUNDLED OR WRAPPED AND SECURED IN CABINET AWAY FROM SHARP EDGES.
6. ALL CABLES SHALL MEET AMPACITY REQUIREMENTS OF THE NATIONAL ELECTRIC CODE. THE MINIMUM CABLE SIZE SHALL BE NO. 12 AWG.
7. ACTUAL NUMBER OF BREAKERS AND BREAKER RATING SHALL BE AS INDICATED ON PLANS AND RESPECTIVE PANEL SCHEDULES.

PANEL SCHEDULE SOUTH

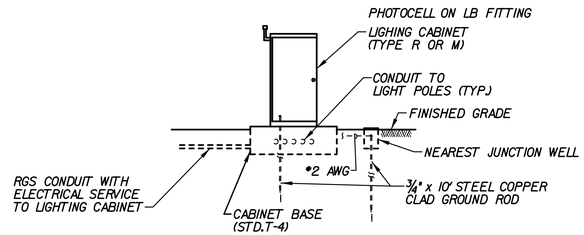
AIC RATING - MINIMUM 22KA
SOLID NEUTRAL
ENCLOSURE: BASE MOUNTED CABINET
600 AMP BUS
480/277 VOLTS
SURFACE MOUNTED
200 AMP MAIN
3 PHASE, 4 WIRE + GROUND
PANEL LOCATION: SEE PLANS

LOAD SERVED	CIRCUIT BREAKER			CKT. NO.	CKT. NO.	CIRCUIT BREAKER			LOAD SERVED
	FRAME	TRIP	POLE			FRAME	TRIP	POLE	
3-1000W HPS	100			1	2	100			3-1000W HPS
3-1000W HPS	100	20	3	3	4	100	20	3	3-1000W HPS
2-1000W HPS	100			5	6	100			2-1000W HPS
3-1000W HPS, 1-100W HPS	100			7	8	100			3-1000W HPS, 1-100W HPS
3-1000W HPS	100	20	3	9	10	100	20	3	3-1000W HPS, 1-100W HPS
2-1000W HPS, 1-100W HPS	100			11	12	100			2-1000W HPS, 2-100W HPS
PHOTOELECTRIC CONTROL	100	10	1	13	14	100	-	1	SPACE
FAN, GFCI	100	10	1	15	16	100	-	1	SPACE
SPACE	100	-	1	17	18	100	-	1	SPACE
SPACE	100	-	1	19	20	100	-	1	SPACE
SPACE	100	-	1	21	22	100	-	1	SPACE
SPACE	100	-	1	23	24	100	-	1	SPACE

PANEL SCHEDULE NORTH

AIC RATING - MINIMUM 22KA
SOLID NEUTRAL
ENCLOSURE: BASE MOUNTED CABINET
600 AMP BUS
480/277 VOLTS
SURFACE MOUNTED
200 AMP MAIN
3 PHASE, 4 WIRE + GROUND
PANEL LOCATION: SEE PLANS

LOAD SERVED	CIRCUIT BREAKER			CKT. NO.	CKT. NO.	CIRCUIT BREAKER			LOAD SERVED
	FRAME	TRIP	POLE			FRAME	TRIP	POLE	
4-1000W HPS	100			1	2	100			3-1000W HPS
4-1000W HPS	100	20	3	3	4	100	20	3	3-1000W HPS
4-1000W HPS	100			5	6	100			2-1000W HPS
3-1000W HPS	100			7	8	100			3-1000W HPS
3-1000W HPS	100	20	3	9	10	100	20	3	3-1000W HPS
2-1000W HPS	100			11	12	100			2-1000W HPS
3-1000W HPS	100			13	14	100			SPARE
3-1000W HPS	100	20	3	15	16	100	20	3	
2-1000W HPS	100			17	18	100			
PHOTOELECTRIC CONTROL	100	10	1	19	20	100	-	1	SPACE
FAN, GFCI	100	10	1	21	22	100	-	1	SPACE
SPACE	100	-	1	23	24	100	-	1	SPACE



LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE DETAIL
SCALE: NONE

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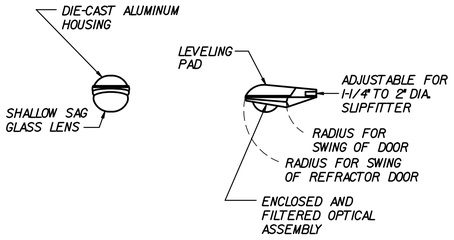
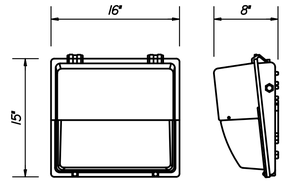
DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	NOT TO SCALE	I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS	CONTRACT T201509002	BRIDGE NO. N/A	LIGHTING DETAILS
				COUNTY NEW CASTLE	DESIGNED BY: WRA	
					CHECKED BY: WRA	

LI-16
SHEET NO. 19
TOTAL SHTS. 26



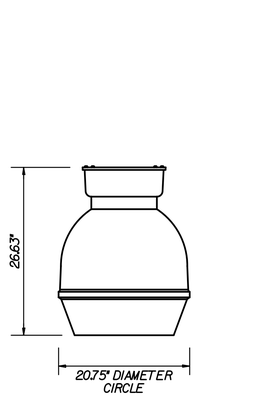
ALL PROPOSED LIGHTING STANDARD LUMINAIRES SHALL BE COBRAHEAD STYLE FIXTURES MOUNTED WITH A ZERO DEGREE TILT ANGLE. THE LUMINAIRE SHALL HAVE A MULTIVOLT BALLAST REGULATOR. PHOTOCONTROL SHALL BE AT THE LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE.

HPS LUMINAIRE DETAIL
SCALE: NONE



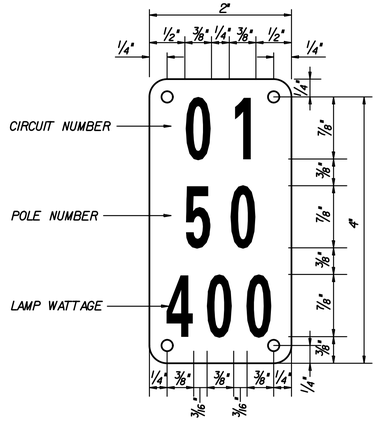
ALL PROPOSED UNDERPASS LUMINAIRES SHALL BE WALL MOUNT STYLE FIXTURES AND SHALL OPERATE AT 277 VOLTS. PHOTOCONTROL SHALL BE AT THE LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE.

UNDERPASS LUMINAIRE DETAIL
SCALE: NONE

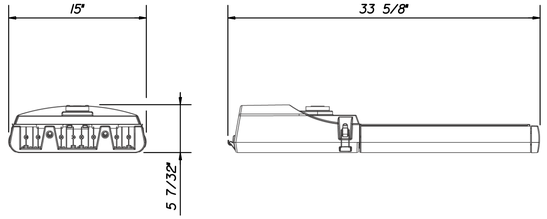


ALL PROPOSED HIGH MAST LUMINAIRES SHALL HAVE CUTOFF OPTICS AND A HIGH BEAM ANGLE. THE LUMINAIRE SHALL HAVE A MULTIVOLT BALLAST REGULATOR. PHOTOCONTROL SHALL BE AT THE LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE.

HIGH MAST LUMINAIRE DETAIL
SCALE: NONE



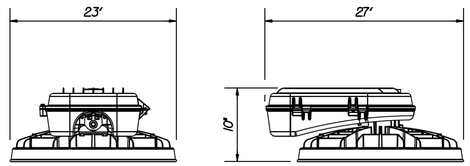
TYPICAL POLE IDENTIFICATION TAG
SCALE: NONE



NOTES:

1. PROPOSED LED LUMINAIRES SHALL UTILIZE 6 LIGHT SQUARES, HAVE A 6000K COLOR TEMPERATURE, 70 CRI AND A TYPE III DISTRIBUTION.
2. LUMINAIRES SHALL PRODUCE A MINIMUM NUMBER OF INITIAL LUMENS FOR THE SPECIFIED WATTAGE:
   210 WATTS - 22,704 LUMENS
   315 WATTS - 31,062 LUMENS
3. UNIVERSAL VOLTAGE 120-277 VOLTS.

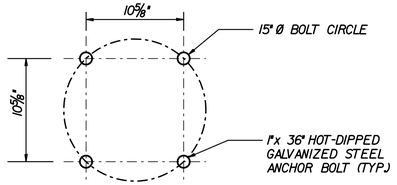
LED LUMINAIRE DETAIL
SCALE: NONE



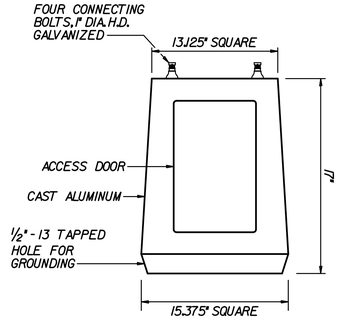
NOTES:

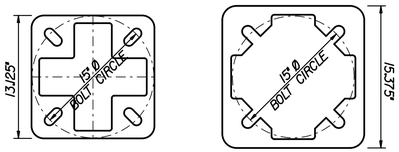
1. PROPOSED HIGH MAST LED LUMINAIRES SHALL UTILIZE 9 LED MODULES, HAVE A 5000K COLOR TEMPERATURE AND AN AREA WIDE DISTRIBUTION.
2. UNIVERSAL VOLTAGE 120-277 VOLTS.

HIGH MAST LED LUMINAIRE DETAIL
SCALE: NONE



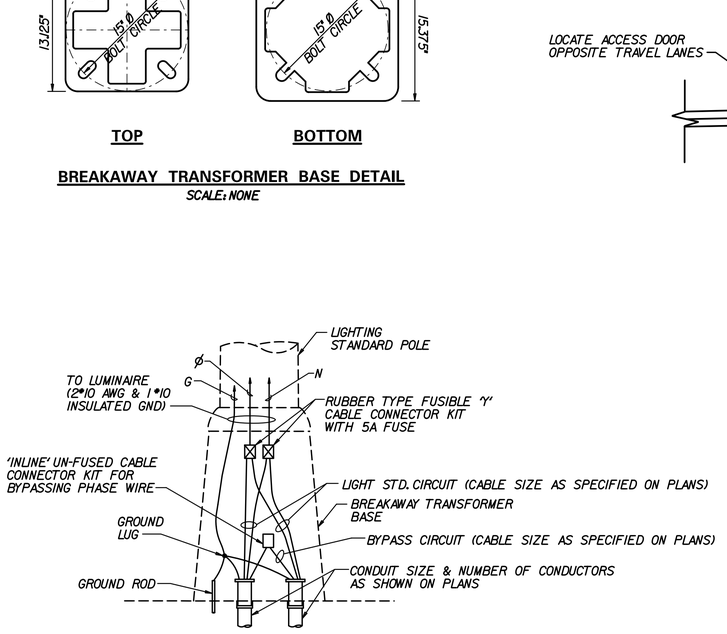
FOUNDATION ANCHOR BOLT CIRCLE DETAIL
SCALE: NONE



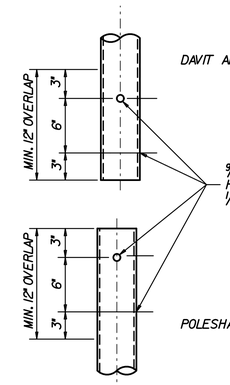


TOP **BOTTOM**

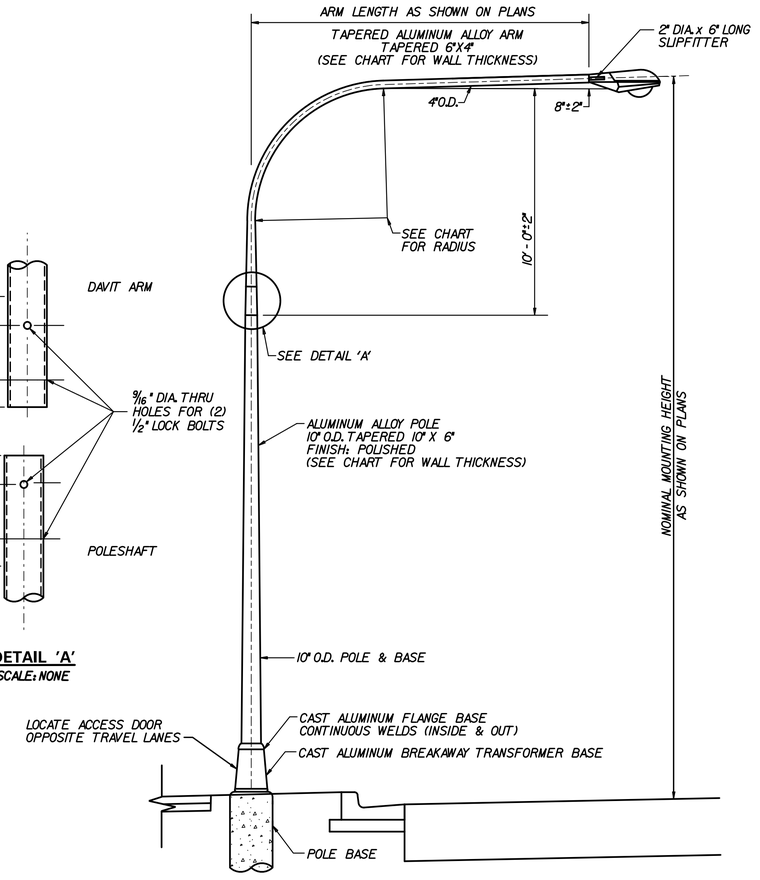
BREAKAWAY TRANSFORMER BASE DETAIL
SCALE: NONE



WIRING IN TRANSFORMER BASE
SCALE: NONE



DETAIL 'A'
SCALE: NONE



MOUNTING HEIGHT	ARM LENGTH	BEND RADIUS	WALL THICKNESS
30'	8'	5'-6"	0.156"
30'	12'	5'-6"	0.156"
30'	15'	5'-6"	0.156"
30'	20'	7'-0"	0.156"
40'	12'	5'-6"	0.188"
40'	15'	5'-6"	0.188"

ALUMINUM LIGHTING STANDARD WITH SINGLE DAVIT ARM
SCALE: NONE

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DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS	

NOT TO SCALE

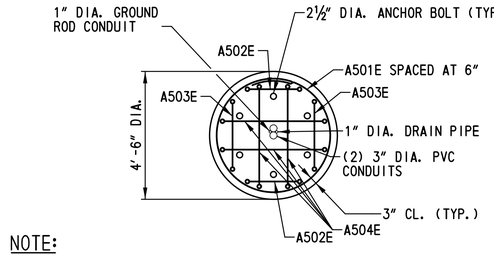
I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS

CONTRACT	BRIDGE NO.	N/A
T201509002	DESIGNED BY: WRA	
COUNTY	CHECKED BY: WRA	
NEW CASTLE		

LIGHTING DETAILS

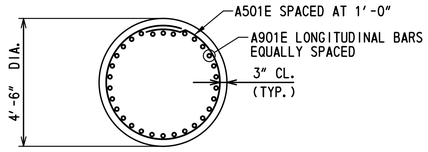
LI-17

SHEET NO.
20
TOTAL SHTS.
26



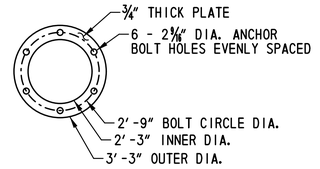
NOTE:
A901E LONGITUDINAL BARS NOT SHOWN FOR CLARITY.

SECTION A-A
SCALE: ⅜"=1'-0"

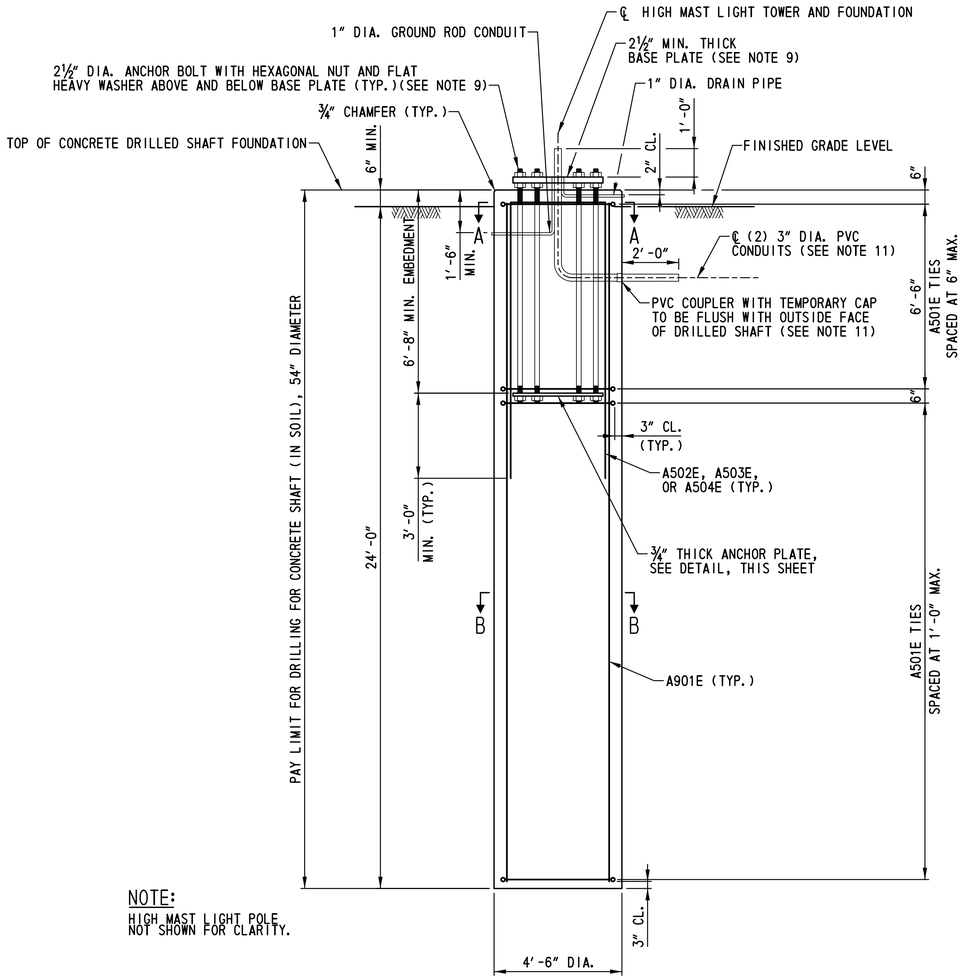


NOTE:
ANCHOR BOLTS NOT SHOWN FOR CLARITY.

SECTION B-B
SCALE: ⅜"=1'-0"

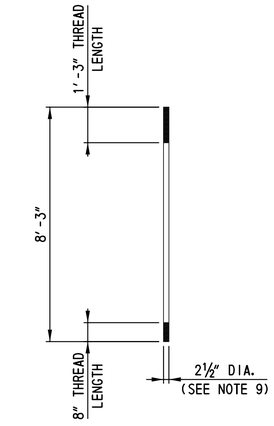


ANCHOR PLATE DETAIL
SCALE: ⅜"=1'-0"



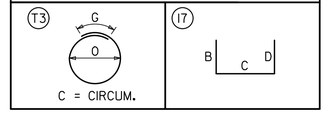
NOTE:
HIGH MAST LIGHT POLE NOT SHOWN FOR CLARITY.

CAISSON FOUNDATION DETAIL
SCALE: ⅜"=1'-0"



ANCHOR BOLT DETAIL
SCALE: ⅜"=1'-0"

BENDING DIAGRAM



BAR MARK	SIZE	NO. REQ'D.	LENGTH	TYPE	DIM. B	DIM. C	DIM. D	DIM. G	DIM. O
A501E	5	32	14'-11"	T3		12'-7"		2'-4"	4'-0"
A502E	5	2	20'-6"	17	9'-3"	2'-0"	9'-3"		
A503E	5	2	21'-0"	17	9'-3"	2'-6"	9'-3"		
A504E	5	4	22'-2"	17	9'-3"	3'-8"	9'-3"		
A901E	9	30	23'-9"	STR.					

GENERAL NOTES:

1. BEFORE CONSTRUCTING THE DRILLED SHAFT THE CONTRACTOR SHALL ACCURATELY LOCATE EXISTING UNDERGROUND UTILITIES IN THE VICINITY OF NEW CONSTRUCTION TO DETERMINE IF THERE IS A CONFLICT. IF A CONFLICT EXISTS, ADJUST THE LOCATION OF THE DRILLED SHAFT TO AVOID CONFLICT AND COMMENCE WITH CONSTRUCTION ONCE APPROVED BY ENGINEER.
2. ALL REINFORCEMENT SHALL BE GRADE 60 MINIMUM AND EPOXY COATED IN ACCORDANCE WITH AASHTO M 284 (ASTM A 775). ALL BAR DIMENSIONS ARE MEASURED OUT TO OUT AND MINIMUM COVER SHALL BE 3" UNLESS OTHERWISE NOTED.
3. CONCRETE IN DRILLED SHAFT FOUNDATION SHALL BE CLASS A (4500 P.S.I) SEE SPECIAL PROVISIONS.
4. ALL NEW STEEL PLATES SHALL CONFORM TO A709, GRADE 36.
5. ANCHOR BOLTS SHALL CONFORM TO F 1554 GRADE 105 UNC THREAD. HEX NUTS SHALL BE USED AND CONFORM TO A 194 GRADE 2H OR A 563 GR. DH. HEAVY WASHERS SHALL BE USED AND CONFORM TO F 436. ANCHOR BOLTS SHALL BE THREADED FOR 15" AT THE TOP END AND 8" AT THE BOTTOM END. NUTS, WASHERS, AND THE ANCHOR BOLTS SHALL BE GALVANIZED PER A 153. THE ANCHOR BOLTS SHALL STICK THROUGH THE TOP BASE PLATE NUTS FOR A LENGTH OF 1 1/2".
6. STEEL TEMPLATES SHALL BE USED TO SET ANCHOR BOLTS PLUMB WHEN POURING THE CONCRETE FOUNDATION. STEEL TEMPLATES SHALL CONTAIN HOLES FOR THE ANCHOR BOLTS 1/16" LARGER THAN THE ANCHOR BOLT DIAMETER.
7. ANCHOR BOLTS SHALL BE INSTALLED WITH MISALIGNMENTS OF LESS THAN 1:40 FROM VERTICAL. AFTER INSTALLATION, FIRM CONTACT SHALL EXIST BETWEEN THE ANCHOR BOLT NUTS, WASHER, AND BASE PLATE. IF ANY ANCHOR BOLT IS IN A MISALIGNED POSITION, A BEVELED WASHER IS REQUIRED IF MISALIGNMENT OF THE ANCHOR ROD IS GREATER THAN 1:40.
8. THE INSTALLATION AND TIGHTENING OF THE ANCHOR BOLTS SHALL BE PERFORMED IN STRICT CONFORMANCE WITH THE SEQUENCE OUTLINED IN APPENDIX A, PART 1 AND 2, SECTION 5.2 OF THE NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM (NCHRP) REPORT 469 - FATIGUE RESISTANCE DESIGN OF CANTILEVER SIGNAL, SIGN AND LIGHT SUPPORTS. SEE SPECIAL PROVISIONS.
9. BASE PLATE THICKNESS TO BE CONFIRMED BY MANUFACTURER'S SUBMITTED POLE AND BASE PLATE DESIGNS. IF BASE PLATE DESIGN REQUIRES A BASE PLATE THICKER THAN 2 1/2" THE ANCHOR BOLT DIAMETER SHALL BE INCREASED TO MATCH THE BASE PLATE THICKNESS.
10. THE ORIENTATION OF THE PVC EXTENSION OUT OF THE DRILLED SHAFT FOUNDATION SHALL BE DETERMINED BY THE ENGINEER IN THE FIELD.
11. UPON COMPLETION OF INSTALLING THE DRILLED SHAFT FOUNDATION, THE CONTRACTOR SHALL LOCATE THE CONDUIT CAST INTO THE DRILLED SHAFT AND INSTALL THE PVC EXTENSION WITH CAP.
12. PAYMENT FOR THE CAISSON FOUNDATION WILL BE MADE UNDER THE DRILLING FOR CONCRETE SHAFT (IN SOIL), 54" DIAMETER ITEM.
13. TEMPORARY STEEL CASING SHALL BE PROVIDED IN ACCORDANCE WITH THE SPECIAL PROVISIONS AND SHALL BE INCIDENTAL TO THE DRILLING FOR CONCRETE SHAFT (IN SOIL), 54" DIAMETER ITEM.
14. THE FOUNDATION HAS BEEN DESIGNED IN ACCORDANCE WITH AASHTO LTS-6 WITH 2015 INTERIM REVISIONS AND AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION WITH 2015 AND 2016 INTERIM REVISIONS.

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DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS	

SCALE: AS NOTED

I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS

CONTRACT	BRIDGE NO.	N/A
T201509002	DESIGNED BY: WRA	
COUNTY	CHECKED BY: WRA	
NEW CASTLE		

LIGHTING DETAILS

LI-18

SHEET NO.	21
TOTAL SHTS.	26

BORING: LB-1 **DATE DRILLED:** 6/10/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 620429.6 **EASTING:** 607874.0
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
1	0.0		MOIST BROWN CLAYEY COARSE SAND AND FINE GRAVEL W/SOME FINE SAND AND SILT.	A-2-4(0)	
	0.0				
2	0.0		MOIST BROWN SILTY COARSE TO FINE SAND AND FINE GRAVEL.	A-1-B	
	2.0				
3	2.0		MOIST BROWN SILTY COARSE SAND AND FINE GRAVEL W/SOME FINE SAND, TRACE OF CLAY.	A-2-4(0)	
	4.0				
4	4.0		MOIST BROWN SILTY COARSE TO FINE SAND AND FINE GRAVEL W/TRACE CLAY.	A-1-B	
	6.0				
5	6.0	11	MOIST MEDIUM DENSE BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND AND SILT.	A-1-B	
		10			
		11			
	8.0	13			
6	8.0	8	MOIST MEDIUM DENSE BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
		12			
		8			
	10.0	7			
7	10.0	WH	MOIST VERY LOOSE BROWN COARSE SANDY FINE GRAVEL W/TRACE FINE SAND AND SILT.	A-1-A	
		WH			
		1			
	12.0	2			
8	12.0	3	MOIST LOOSE BROWN COARSE SANDY FINE GRAVEL W/TRACE FINE SAND AND SILT.	A-1-B	
		3			
		2			
	14.0	3			
9	14.0	3	MOIST LOOSE BROWN COARSE SANDY FINE GRAVEL W/TRACE FINE SAND AND SILT.	A-1-A	
		3			
		2			
	16.0	2			
10	16.0	9	MOIST MEDIUM DENSE BROWN FINE GRAVEL AND COARSE SAND W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
		7			
		7			
	18.0	8			
11	18.0	14	MOIST VERY DENSE BROWN COARSE SANDY FINE GRAVEL W/TRACE FINE SAND AND SILT.	A-1-A	
		21			
		34			
	24.0	30			
12	24.0	24	MOIST VERY DENSE GRAY COARSE SANDY FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-A	
		22			
		28			
	28.0	26			
13	28.0	50	NO SIEVE ANALYSIS - INDICATION OF MOIST VERY DENSE GRAY FINE TO COARSE SAND W/SOME FINE GRAVEL AND SILT.		
	34.0				
14	34.0	10	WET MEDIUM DENSE BROWN SILTY FINE GRAVEL W/SOME COARSE TO FINE SAND AND CLAY.	A-1-B	
		8			
		9			
	38.0	8			
15	38.0	26	WET VERY STIFF RED FINE GRAVELLY CLAY W/SOME COARSE TO FINE SAND AND SILT.	A-6(1)	
		11			
		11			
	44.0	13			
16	44.0	9	WET VERY STIFF RED FINE GRAVELLY CLAY W/SOME FINE SAND AND SILT, TRACE OF COARSE SAND.	A-6(7)	
		13			
		13			
	48.0	15			
	48.0		END BORING		
	50.0				

BORING: LB-2 **DATE DRILLED:** 6/11/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 621020.9 **EASTING:** 607625.1
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
1	0.0		MOIST BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL AND SILT.	A-1-B	
	0.0				
2	0.0		MOIST BROWN SILTY COARSE TO FINE SAND W/SOME CLAY, TRACE OF FINE GRAVEL.	A-2-4(0)	
	2.0				
3	2.0		MOIST BROWN SILTY COARSE TO FINE SAND W/TRACE FINE GRAVEL.	A-2-4(0)	
	4.0				
4	4.0		MOIST BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL, TRACE OF CLAY.	A-2-4(0)	
	6.0				
5	6.0	16	MOIST MEDIUM DENSE BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
		13			
		12			
	8.0	10			
6	8.0	9	MOIST MEDIUM DENSE BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
		8			
		7			
	10.0	10			
7	10.0	3	MOIST LOOSE BROWN COARSE SAND AND FINE GRAVEL W/TRACE FINE SAND AND SILT.	A-1-B	
		3			
		3			
	12.0	3			
8	12.0	4	MOIST LOOSE BROWN COARSE SAND AND FINE GRAVEL W/TRACE FINE SAND AND SILT.	A-1-A	
		5			
		3			
	14.0	3			
9	14.0	4	MOIST LOOSE BROWN FINE GRAVELLY COARSE SAND W/TRACE FINE SAND AND SILT.	A-1-B	
		3			
		3			
	16.0	4			
10	16.0	36	MOIST MEDIUM DENSE BROWN COARSE SANDY FINE GRAVEL W/TRACE FINE SAND AND SILT.	A-1-A	
		10			
		10			
	18.0	7			
11	18.0	10	MOIST SAND DENSE BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL, TRACE OF SILT.	A-1-B	
		11			
		13			
	24.0	12			
12	24.0	11	MOIST MEDIUM DENSE BROWN COARSE SANDY FINE GRAVEL W/TRACE FINE SAND AND SILT.	A-1-A	
		8			
		7			
	28.0	9			

BORING: LB-2 CONT.

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
13	28.0	11	MOIST MEDIUM DENSE BROWN COARSE SANDY FINE GRAVEL W/SOME FINE SAND AND SILT.	A-1-B	
		10			
		9			
	34.0	10			
14	34.0	7	MOIST MEDIUM DENSE BROWN COARSE SANDY FINE GRAVEL W/SOME FINE SAND AND SILT.	A-1-B	
		10			
		11			
	38.0	20			
15	38.0	11	MOIST MEDIUM DENSE BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
		15			
		11			
	44.0	13			
16	44.0	12	MOIST DENSE BROWN COARSE TO FINE SAND AND FINE GRAVEL W/SOME SILT.	A-1-B	
		17			
		18			
	48.0	17			
	48.0		END BORING		
	50.0				

BORING: LB-3 **DATE DRILLED:** 6/1/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 621418.2 **EASTING:** 607976.5
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
1	0.0		MOIST BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL W/SOME SILT.	A-1-B	
	0.0				
2	0.0		MOIST BROWN SILTY COARSE TO FINE SAND W/SOME CLAY, TRACE OF FINE GRAVEL.	A-2-4(0)	
	2.0				
3	2.0		MOIST BROWN CLAYEY COARSE SAND W/SOME FINE SAND, FINE GRAVEL AND SILT.	A-2-4(0)	
	4.0				
4	4.0	7	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-1-B	
		12			
		13			
	6.0	14			
5	6.0	5	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL	A-1-B	
		8			
		9			
	8.0	10			
6	8.0	11	MOIST DENSE BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND AND SILT.	A-1-B	
		18			
		24			
	10.0	23			
7	10.0	17	MOIST DENSE BROWN COARSE SAND W/SOME FINE GRAVEL AND FINE SAND, TRACE OF SILT.	A-1-B	
		20			
		28			
	12.0	35			
8	12.0	9	WET MEDIUM DENSE BROWN COARSE TO FINE SAND W/SOME SILT, TRACE OF FINE.	A-1-B	
		11			
		13			
	14.0	15			
9	14.0	11	WET MEDIUM DENSE BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL, TRACE OF SILT.	A-1-B	
		12			
		16			
	16.0	15			
10	16.0	18	SATURATED FIRM BLACK ORGANIC SILT W/TRACE FINE TO COARSE SAND.	A-4(0)	
		4			
		4			
	18.0	6			
11	18.0	2	SATURATED FIRM BLACK ORGANIC SILTY CLAY W/TRACE FINE TO COARSE SAND AND FINE GRAVEL.	A-7-5(19)	
		3			
		3			
	24.0	2			
12	24.0	2	SATURATED SOFT BLACK ORGANIC SILTY CLAY W/TRACE FINE TO COARSE SAND.	A-7-5(22)	
		2			
		1			
	29.0	3			
13	29.0	2	SATURATED STIFF BLACK CLAYEY SILT W/SOME FINE GRAVEL, TRACE OF FINE TO COARSE SAND.	A-4(4)	
		3			
		7			
	34.0	9			
14	34.0	4	SATURATED LOOSE GRAY COARSE TO FINE SAND AND FINE GRAVEL, TRACE OF SILT.	A-1-B	
		4			
		6			
	39.0	9			
15	39.0	29	SATURATED VERY DENSE GRAY SILTY FINE SAND AND FINE GRAVEL W/SOME COARSE SAND.	A-1-B	
		32			
		23			
	44.0	13			
16	44.0	7	SATURATED VERY STIFF RED FINE SANDY SILT.	A-4(0)	
		8			
		10			
	48.0	11			
17	48.0	10	SATURATED VERY STIFF RED FINE SANDY SILT W/TRACE COARSE SAND.	A-4(0)	
		12			
		12			
	53.0	14			
	53.0		END BORING		
	55.0				

BORING: LB-4 **DATE DRILLED:** 5/21/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 622155.8 **EASTING:** 608062
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
1	0.0		MOIST BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-1-B	
	0.0				
2	0.0		MOIST BROWN COARSE SAND W/SOME FINE SAND, FINE GRAVEL AND SILT.	A-1-B	
	2.0				
3	2.0		MOIST BROWN COARSE SAND W/SOME FINE SAND, FINE GRAVEL AND SILT.	A-1-B	
	4.0				
4	4.0	5	MOIST VERY DENSE BROWN COARSE SAND W/SOME FINE SAND, FINE GRAVEL AND SILT.	A-1-B	
		18			
		40			
	6.0	20			

BORING: LB-4 CONT.

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
5	6.0	6	MOIST VERY DENSE BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND AND SILT.	A-1-B	
		18			
		32			
	8.0	23			
6	8.0	20	MOIST DENSE BROWN FINE GRAVEL AND COARSE SAND W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
		20			
		15			
	10.0	10			
7	10.0	13	MOIST MEDIUM DENSE BROWN FINE GRAVELLY COARSE SAND W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
		16			
		13			
	12.0	11			
8	12.0	1	SATURATED SOFT BROWN ORGANIC SILTY CLAY W/TRACE FINE TO COARSE SAND.	A-7-5(21)	
		2			
		1			
	14.0	3			
9	14.0	3	SATURATED FIRM BROWN ORGANIC SILTY CLAY W/TRACE FINE TO COARSE SAND.	A-7-5(22)	
		4			
		4			
	16.0	5			
10	16.0	4	SATURATED FIRM BROWN ORGANIC SILTY CLAY W/TRACE FINE TO COARSE SAND AND FINE GRAVEL.	A-7-5(19)	
		4			
		4			
	18.0	5			
11	18.0	1	SATURATED FIRM BROWN ORGANIC SILTY CLAY W/TRACE FINE TO COARSE SAND.	A-7-5(21)	
		3			
		3			
	24.0	3			
12	24.0	1	SATURATED FIRM BROWN CLAYEY FINE SANDY SILT W/SOME CLAY, TRACE OF COARSE SAND.	A-4(3)	
		2			
		3			
	29.0	3			
13	29.0	2	SATURATED DENSE BROWN COARSE TO FINE SAND AND FINE GRAVEL W/TRACE SILT.	A-1-B	
		20			
		25			
	34.0	20			
14	34.0	30	SATURATED VERY DENSE BROWN COARSE SANDY FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-A	
		40			
		30			
	39.0	20			
15	39.0	18	SATURATED VERY DENSE BROWN COARSE SANDY FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
		35			
		25			
	44.0	30			
16	44.0	6	SATURATED STIFF RED SILTY CLAY W/SOME FINE SAND, TRACE OF COARSE SAND.	A-7-6(19)	
		7			
		8			
	48.0	12			
17	48.0	8	SATURATED VERY STIFF RED FINE SANDY SILT W/TRACE COARSE SAND, FINE GRAVEL AND CLAY.	A-4(0)	
		10			
		10			
	54.0	12			
	54.0		END BORING		
	56.0				

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DELAWARE DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

NONE

I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS

CONTRACT T201509002
COUNTY NEW CASTLE
BRIDGE NO. N/A
DESIGNED BY: WRA
CHECKED BY: WRA

BORING LOG

BO-01
SHEET NO. 22
TOTAL SHTS. 26

BORING: LB-5 **DATE DRILLED:** 5/21/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 622850.3 **EASTING:** 608229.2
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
	SAMPLE INFORMATION				
1	0.0 0.0		MOIST SAND SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-2-4(0)	
2	0.0 2.0		MOIST BROWN COARSE SAND W/SOME FINE SAND, FINE GRAVEL AND SILT.	A-1-B	
3	2.0 4.0		MOIST BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND, SILT AND CLAY.	A-1-B	
4	4.0 6.0		MOIST BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND AND SILT.	A-1-B	
5	6.0 8.0	7 9 11 14	WET MEDIUM DENSE BROWN COARSE TO FINE SAND W/SOME SILT, TRACE OF FINE GRAVEL.	A-1-B	
6	8.0 10.0	12 14 10 11	WET MEDIUM DENSE BROWN COARSE TO FINE SAND W/TRACE FINE GRAVEL AND SILT.	A-1-B	
7	10.0 12.0	1 2 2 4	WET SOFT BROWN SILTY CLAY W/TRACE FINE TO COARSE SAND.	A-6(13)	
8	12.0 14.0	3 2 1 2	WET SOFT BROWN COARSE SANDY SILT W/SOME FINE SAND, TRACE OF FINE GRAVEL.	A-4(0)	
9	14.0 16.0	3 4 3 4	SATURATED FIRM BROWN SILTY CLAY W/TRACE FINE TO COARSE SAND.	A-7-6(15)	
10	16.0 18.0	2 3 3 4	SATURATED FIRM BROWN SILTY CLAY W/TRACE FINE TO COARSE SAND.	A-7-5(19)	
11	18.0 24.0	3 3 3 3	SATURATED FIRM BROWN CLAYEY SILT W/TRACE FINE TO COARSE SAND.	A-4(11)	
12	24.0 28.0	3 3 4 4	SATURATED FIRM BROWN SILTY CLAY W/TRACE FINE TO COARSE SAND AND FINE GRAVEL.	A-6(10)	
13	28.0 34.0	9 10 11 13	SATURATED VERY STIFF BROWN COARSE TO FINE SANDY SILT W/TRACE FINE GRAVEL.	A-4(0)	
14	34.0 38.0	9 11 13 16	SATURATED MEDIUM DENSE BROWN FINE GRAVELLY COARSE SAND W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
15	38.0 44.0	8 9 12 13	SATURATED MEDIUM DENSE BROWN FINE GRAVEL AND COARSE SAND W/TRACE FINE SAND AND SILT.	A-1-B	
16	44.0 48.0	11 13 13 14	SATURATED VERY STIFF RED FINE SANDY SILT W/TRACE COARSE SAND AND FINE GRAVEL.	A-4(0)	
	48.0 50.0		END BORING		

BORING: LB-6 **DATE DRILLED:** 6/8/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 620529 **EASTING:** 607275.5
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
	SAMPLE INFORMATION				
1	0.0 0.0		MOIST BROWN FINE GRAVELLY COARSE TO FINE SAND W/SOME SILT.	A-1-B	
2	0.0 2.0		MOIST BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND AND SILT.	A-1-B	
3	2.0 4.0		MOIST BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL AND SILT.	A-1-B	
4	4.0 6.0		MOIST BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-2-4(0)	
5	6.0 8.0	8 22 32 35	MOIST VERY DENSE BROWN FINE GRAVELLY COARSE SAND W/SOME FINE SAND AND SILT.	A-1-B	
6	8.0 10.0	14 24 26 29	MOIST DENSE BROWN COARSE SAND W/SOME FINE GRAVEL AND FINE SAND, TRACE OF SILT.	A-1-B	
7	10.0 12.0	7 19 20 16	MOIST DENSE BROWN FINE GRAVELLY COARSE SAND W/SOME FINE SAND AND SILT.	A-1-B	
8	12.0 14.0	6 9 11 16	MOIST MEDIUM DENSE BROWN FINE GRAVELLY COARSE SAND W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
9	14.0 16.0	9 11 9 9	MOIST MEDIUM DENSE BROWN COARSE SAND W/SOME FINE GRAVEL, TRACE OF FINE SAND AND SILT.	A-1-B	
10	16.0 18.0	5 6 5 5	WET MEDIUM DENSE BROWN COARSE SAND W/TRACE FINE GRAVEL, FINE SAND AND SILT.	A-1-B	
11	18.0 24.0	8 2 2 2	WET VERY LOOSE BROWN COARSE SAND W/SOME FINE GRAVEL, TRACE OF FINE SAND AND SILT.	A-1-B	

BORING: LB-6 CONT.

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
	SAMPLE INFORMATION				
12	24.0 28.0	2 3 3	WET LOOSE BROWN COARSE SAND W/TRACE FINE GRAVEL, FINE SAND AND SILT.	A-1-B	
13	28.0 34.0	8 6 4 4	WET LOOSE BROWN COARSE SAND W/SOME FINE GRAVEL, TRACE OF FINE SAND AND SILT.	A-1-B	
14	34.0 38.0	9 10 11 16	WET MEDIUM DENSE BROWN FINE SAND W/SOME COARSE SAND AND SILT, TRACE OF FINE GRAVEL.	A-2-4(0)	
15	38.0 44.0	38 14 14 16	WET MEDIUM DENSE BROWN COARSE SANDY FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-A	
16	44.0 48.0	24 16 14 15	WET DENSE BROWN COARSE SANDY FINE GRAVEL W/SOME FINE SAND AND SILT.	A-1-B	
	48.0 50.0		END BORING		

BORING: LB-7 **DATE DRILLED:** 6/2/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 621125.2 **EASTING:** 606876.9
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
	SAMPLE INFORMATION				
1	0.0 0.0		MOIST BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL AND SILT.	A-1-B	
2	0.0 2.0		MOIST BROWN COARSE SAND W/SOME FINE SAND, FINE GRAVEL AND SILT.	A-1-B	
3	2.0 4.0	3 7 10 12	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-2-4(0)	
4	4.0 6.0	9 11 13 16	MOIST VERY STIFF BROWN CLAYEY COARSE SANDY SILT W/SOME FINE SAND AND FINE GRAVEL.	A-4(0)	
5	6.0 8.0	9 11 13 30	MOIST VERY STIFF BROWN COARSE SANDY SILT W/SOME FINE SAND, FINE GRAVEL AND CLAY.	A-4(0)	
6	8.0 10.0	32 32 18 26	MOIST HARD BROWN COARSE SANDY SILT W/SOME FINE SAND AND CLAY, TRACE OF FINE GRAVEL.	A-4(0)	
7	10.0 12.0	22 18 15 12	MOIST DENSE BROWN SILTY COARSE SAND W/SOME FINE SAND, TRACE OF FINE GRAVEL.	A-2-4(0)	
8	12.0 14.0	16 20 30 24	MOIST VERY DENSE BROWN SILTY COARSE TO FINE SAND W/TRACE FINE GRAVEL.	A-1-B	
9	14.0 16.0	35 50	MOIST VERY DENSE BROWN COARSE TO FINE SAND W/SOME SILT, TRACE OF FINE GRAVEL.	A-1-B	
10	16.0 18.0	22 25 22 18	MOIST DENSE BROWN FINE GRAVELLY COARSE SAND W/SOME FINE SAND AND SILT.	A-1-B	
11	18.0 24.0	17 25 25 26	MOIST VERY DENSE BROWN COARSE SAND W/SOME FINE SAND AND FINE GRAVEL, TRACE OF SILT.	A-1-B	
12	24.0 29.0	1 1 2 5	WET VERY LOOSE BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL, TRACE OF SILT.	A-1-B	
13	29.0 34.0	7 10 10 9	WET MEDIUM DENSE BROWN COARSE SAND W/SOME FINE SAND, TRACE OF FINE GRAVEL AND SILT.	A-1-B	
14	34.0 39.0	4 6 8 9	WET MEDIUM DENSE BROWN COARSE TO FINE SAND W/TRACE FINE GRAVEL AND SILT.	A-1-B	
15	39.0 44.0	8 10 14 13	WET VERY STIFF BROWN FINE SANDY SILT W/SOME COARSE SAND AND FINE GRAVEL.	A-4(0)	
16	44.0 49.0	30 40 30 25	WET VERY DENSE BROWN COARSE SANDY FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
	49.0 51.0		END BORING		

BORING: LB-8 **DATE DRILLED:** 6/4/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 621846.6 **EASTING:** 606942
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
	SAMPLE INFORMATION				
1	0.0 0.0		MOIST BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-1-B	
2	0.0 2.0		MOIST BROWN COARSE TO FINE SAND W/SOME SILT, TRACE OF FINE GRAVEL.	A-1-B	
3	2.0 4.0		MOIST BROWN SILTY COARSE TO FINE SAND W/TRACE FINE GRAVEL AND CLAY.	A-2-4(0)	
4	4.0 6.0	9 11 15 24	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-1-B	

BORING: LB-8 CONT.

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
	SAMPLE INFORMATION				
5	6.0 8.0	8 16 32 23	MOIST DENSE BROWN FINE GRAVELLY COARSE SAND W/SOME FINE SAND AND SILT.	A-1-B	
6	8.0 10.0	11 13 24 36	MOIST HARD BROWN CLAYEY FINE SANDY FINE GRAVELLY SILT W/SOME COARSE SAND.	A-4(0)	
7	10.0 12.0	21 32 33 28	MOIST HARD BROWN COARSE SANDY SILT W/SOME FINE SAND, FINE GRAVEL AND CLAY/	A-4(0)	
8	12.0 14.0	18 32 33 50	MOIST VERY DENSE BROWN SILTY COARSE TO FINE SAND W/TRACE FINE GRAVEL.	A-2-4(0)	
9	14.0 16.0	14 16 24 39	MOIST DENSE BROWN SILTY COARSE SAND W/SOME FINE SAND AND FINE GRAVEL.	A-1-B	
10	16.0 18.0	14 10 12 10	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-2-4(0)	
11	18.0 24.0	24 26 37 25	MOIST VERY DENSE BROWN COARSE SAND W/SOME FINE GRAVEL, FINE SAND AND SILT.	A-1-B	
12	24.0 29.0	10 12 10 9	MOIST MEDIUM DENSE BROWN COARSE SAND AND FINE GRAVEL W/TRACE FINE SAND AND SILT.	A-1-B	
13	29.0 34.0	7 7 9 11	MOIST MEDIUM DENSE BROWN FINE GRAVELLY COARSE SAND W/TRACE FINE SAND AND SILT.	A-1-B	
14	34.0 39.0	8 10 12 9	WET MEDIUM DENSE BROWN FINE GRAVELLY COARSE SAND W/TRACE FINE SAND AND SILT.	A-1-B	
15	39.0 44.0	13 14 15 20	WET MEDIUM DENSE BROWN SILTY FINE TO COARSE SAND W/TRACE FINE GRAVEL.	A-2-4(0)	
16	44.0 48.0	17 20 19 15	NO SAMPLE		
	48.0 50.0		END BORING		

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DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

NONE

I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS

CONTRACT	T201509002
COUNTY	NEW CASTLE
BRIDGE NO.	N/A
DESIGNED BY:	WRA
CHECKED BY:	WRA

BORING LOG

BO-02

SHEET NO.	23
TOTAL SHTS.	26

BORING: LB-9 **DATE DRILLED:** 6/9/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 622508.8 **EASTING:** 607173.2
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
	SAMPLE INFORMATION				
1	0.0		MOIST BROWN SILTY COARSE TO FINE SAND W/TRACE FINE GRAVEL.	A-2-4(0)	
	0.0				
2	0.0		MOIST BROWN SILTY COARSE SAND W/SOME FINE SAND AND FINE GRAVEL.	A-2-4(0)	
	2.0				
3	2.0		WET BROWN CLAYEY COARSE TO FINE SAND W/SOME SILT, TRACE OF FINE GRAVEL.	A-2-4(0)	
	4.0				
4	4.0		WET BROWN SILTY COARSE TO FINE SAND W/SOME CLAY, TRACE OF FINE GRAVEL.	A-2-4(0)	
	6.0				
5	6.0	15	WET DENSE BROWN SILTY COARSE SAND W/SOME FINE SAND, FINE GRAVEL AND CLAY.	A-2-4(0)	
		20			
		18			
	8.0	17			
6	8.0	50	WET VERY DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-2-4(0)	
	10.0				
7	10.0	20	WET DENSE BROWN SILTY COARSE TO FINE SAND W/TRACE FINE GRAVEL.	A-2-4(0)	
		26			
		21			
	12.0	20			
8	12.0	13	WET VERY DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-1-B	
		24			
		44			
	14.0	39			
9	14.0	50	WET VERY DENSE BROWN COARSE TO FINE SAND W/SOME SILT, TRACE OF FINE GRAVEL.	A-2-4(0)	
	16.0				
10	16.0	19	WET DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-1-B	
		16			
		21			
	18.0	16			
11	18.0	15	WET DENSE BROWN COARSE SAND W/SOME FINE SAND AND FINE GRAVEL, TRACE OF SILT.	A-1-B	
		25			
		21			
	24.0	20			
12	24.0	14	WET VERY DENSE BROWN COARSE SAND W/TRACE FINE SAND, FINE GRAVEL AND SILT.	A-1-B	
		16			
	28.0	50			
13	28.0	50	WET VERY DENSE BROWN COARSE SAND AND FINE GRAVEL W/TRACE FINE SAND AND SILT.	A-1-B	
	34.0				
14	34.0	21	WET MEDIUM DENSE BROWN SILTY FINE TO COARSE SAND AND FINE GRAVEL.	A-2-4(0)	
		11			
		9			
	38.0	10			
15	38.0	38	WET DENSE BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
		18			
		17			
	44.0	16			
16	44.0	10	WET DENSE BROWN FINE GRAVELLY COARSE SAND W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
		16			
		15			
	48.0	17			
	48.0		END BORING		
	50.0				

BORING: LB-10 **DATE DRILLED:** 6/3/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 622906.2 **EASTING:** 607722.4
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
	SAMPLE INFORMATION				
1	0.0		MOIST BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-2-4(0)	
	0.0				
2	0.0		MOIST BROWN SILTY COARSE SAND W/SOME FINE SAND AND FINE GRAVEL.	A-1-B	
	2.0				
3	2.0		MOIST BROWN COARSE TO FINE SAND W/SOME SILT, TRACE OF FINE GRAVEL.	A-1-B	
	4.0				
4	4.0		MOIST BROWN FINE GRAVELLY COARSE SAND W/SOME FINE SAND AND SILT.	A-1-B	
	6.0				
5	6.0	9	MOIST DENSE BROWN FINE GRAVEL AND COARSE SAND W/SOME FINE SAND AND SILT.	A-1-B	
		12			
		21			
	8.0	13			
6	8.0	9	MOIST VERY STIFF BROWN COARSE TO FINE SANDY SILT W/SOME CLAY, TRACE OF FINE GRAVEL.	A-4(0)	
		11			
		12			
	10.0	14			
7	10.0	10	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/TRACE FINE GRAVEL.	A-2-4(0)	
		13			
		16			
	12.0	17			
8	12.0	13	MOIST DENSE BROWN FINE GRAVELLY COARSE SAND W/SOME FINE SAND AND SILT.	A-1-B	
		18			
		22			
	14.0	14			
9	14.0	18	MOIST DENSE BROWN SILTY COARSE TO FINE SAND W/TRACE FINE GRAVEL.	A-2-4(0)	
		21			
		20			
	16.0	16			
10	16.0	10	MOIST DENSE BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL, TRACE OF SILT.	A-1-B	
		21			
		24			
	18.0	14			
11	18.0	6	WET MEDIUM DENSE BROWN COARSE TO FINE SAND W/TRACE SILT AND FINE GRAVEL.	A-1-B	
		7			
		9			
	24.0	9			
12	24.0	3	WET LOOSE BROWN COARSE SAND W/SOME FINE GRAVEL, TRACE OF FINE SAND AND SILT.	A-1-B	
		5			
		5			
	28.0	6			
13	28.0	5	WET MEDIUM DENSE BROWN FINE GRAVELLY COARSE SAND W/TRACE FINE SAND AND SILT.	A-1-B	
		6			
		7			
	34.0	6			

BORING: LB-10 CONT.

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
	SAMPLE INFORMATION				
14	34.0	5	WET LOOSE BROWN FINE GRAVELLY COARSE SAND W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
		4			
		5			
	39.0	3			
15	39.0	8	WET MEDIUM DENSE BROWN COARSE SAND W/SOME FINE GRAVEL, TRACE OF FINE SAND AND SILT.	A-1-B	
		9			
		9			
	44.0	11			
16	44.0	10	WET MEDIUM DENSE BROWN FINE SAND AND FINE GRAVEL W/SOME COARSE SAND AND SILT.	A-1-B	
		11			
		14			
	48.0	16			
	48.0		END BORING		
	50.0				

BORING: LB-11 **DATE DRILLED:** 6/1/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 623483 **EASTING:** 608568.9
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
	SAMPLE INFORMATION				
1	0.0		WET BROWN FINE SANDY SILT W/SOME COARSE SAND, TRACE OF FINE GRAVEL.	A-4(0)	
	0.0				
2	0.0	9	WET HARD BROWN COARSE SANDY SILT W/TRACE FINE SAND AND FINE GRAVEL.	A-4(0)	
		16			
		19			
	2.0	20			
3	2.0	9	WET VERY DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-2-4(0)	
		40			
	4.0	50			
4	4.0	10	WET STIFF BROWN COARSE TO FINE SANDY SILT W/SOME CLAY, TRACE OF FINE GRAVEL.	A-4(0)	
		9			
		7			
	6.0	12			
5	6.0	6	WET MEDIUM DENSE BROWN FINE GRAVELLY COARSE TO FINE SAND W/SOME SILT.	A-1-B	
		12			
		12			
	8.0	12			
6	8.0	6	WET MEDIUM DENSE BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL, TRACE OF SILT.	A-1-B	
		8			
		9			
	10.0	12			
7	10.0	3	WET MEDIUM DENSE BROWN COARSE SAND W/SOME FINE GRAVEL AND FINE SAND, TRACE OF SILT.	A-1-B	
		5			
		6			
	12.0	3			
8	12.0	2	SATURATED FIRM BROWN SILTY CLAY W/TRACE FINE TO COARSE SAND.	A-7-6(17)	
		2			
		3			
	14.0	4			
9	14.0	3	SATURATED FIRM BLACK ORGANIC SILTY CLAY W/TRACE FINE TO COARSE SAND.	A-7-6(18)	
		4			
		3			
	16.0	4			
10	16.0	2	SATURATED SOFT BLACK ORGANIC CLAYEY SILT W/TRACE FINE TO COARSE SAND AND FINE GRAVEL.	A-5(11)	
		2			
		2			
	18.0	2			
U-1	18.0				
	22.0				
11	22.0	20	SATURATED VERY DENSE BLACK FINE GRAVEL W/SOME SILT AND FINE TO COARSE SAND.	A-1-A	
	24.0	50			
12	24.0	50	SATURATED VERY DENSE BLACK COARSE TO FINE SAND W/SOME FINE GRAVEL, TRACE OF SILT.	A-1-B	
	29.0				
13	29.0	42	SATURATED VERY DENSE BLACK COARSE SANDY FINE GRAVEL W/SOME FINE SAND AND SILT.	A-1-B	
		20			
	34.0	50			
14	34.0	11	SATURATED VERY STIFF RED SILTY CLAY W/SOME FINE SAND, TRACE OF COARSE SAND.	A-7-6(16)	
		11			
		9			
	39.0	14			
15	39.0	9	SATURATED VERY STIFF RED CLAYEY FINE SANDY SILT W/TRACE COARSE SAND.	A-4(2)	
		10			
		11			
	44.0	9			
16	44.0	7	SATURATED VERY STIFF RED CLAYEY FINE SANDY SILT W/SOME COARSE SAND.	A-4(0)	
		11			
		16			
	49.0	25			
	49.0		END BORING		
	51.0				

BORING: LB-12 **DATE DRILLED:** 6/16/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 624542.9 **EASTING:** 609911.9
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
	SAMPLE INFORMATION				
1	0.0		MOIST BROWN SILTY COARSE SAND W/SOME FINE SAND, TRACE OF FINE GRAVEL.	A-2-4(0)	
	0.0				
2	0.0		MOIST BROWN SILTY COARSE TO FINE SAND W/SOME CLAY, TRACE OF FINE GRAVEL.	A-2-4(0)	
	2.0				
3	2.0		MOIST BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-1-B	
	4.0				
4	4.0		MOIST BROWN SILTY COARSE SAND W/SOME FINE GRAVEL AND FINE SAND.	A-1-B	
	6.0				
5	6.0	8	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/TRACE FINE GRAVEL.	A-2-4(0)	
		10			
		13			
	8.0	13			
6	8.0	8	MOIST DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-1-B	
		11			
		22			
	10.0	23			

BORING: LB-12 CONT.

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
	SAMPLE INFORMATION				
7	10.0	11	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/SOME CLAY, TRACE OF FINE GRAVEL.	A-2-4(0)	
		13			
		15			
	12.0	16			
8	12.0	11	MOIST MEDIUM DENSE BROWN SILTY COARSE SAND W/SOME FINE SAND AND FINE GRAVEL.	A-1-B	
		8			
		9			
	14.0	11			
9	14.0	7	MOIST MEDIUM DENSE BROWN SILTY COARSE SAND W/SOME FINE SAND AND FINE GRAVEL, TRACE OF CLAY.	A-2-4(0)	
		9			
		8			
	16.0	9			
10	16.0	7	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/TRACE FINE GRAVEL.	A-1-B	
		8			
		9			
	18.0	13			
11	18.0	8	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/SOME CLAY, TRACE OF FINE GRAVEL.	A-2-4(0)	
		11			
		13			
	24.0	16			
12	24.0	7	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-2-4(0)	
		9			
		13			
	29.0	17			
13	29.0	13	MOIST VERY DENSE BROWN FINE GRAVELLY COARSE SAND W/TRACE FINE SAND AND SILT.	A-1-B	
	34.0	50			
14	34.0	50	NO SAMPLE		
	39.0				
15	39.0	9	WET MEDIUM DENSE BROWN FINE TO COARSE SAND W/SOME SILT, TRACE OF FINE GRAVEL.	A-2-4(0)	
		11			
		13			
	44.0	10			
16	44.0	28	SATURATED HARD BLACK FINE GRAVELLY SILT W/SOME FINE SAND, TRACE OF COARSE SAND.	A-4(0)	
	48.0	50			
	48.0		END BORING		
	50.0				

BORING: LB-13 **DATE DRILLED:** 6/18/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 624348.9 **EASTING:** 609177.7
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
	SAMPLE INFORMATION				
1	0.0		WET BROWN COARSE TO FINE SANDY SILT W/TRACE FINE GRAVEL AND CLAY.	A-4(0)	
	0.0				
2	0.0		WET BROWN CLAYEY COARSE TO FINE SAND W/SOME SILT, TRACE OF FINE GRAVEL.	A-2-4(0)	
	2.0				
3	2.0		WET BROWN COARSE TO FINE SANDY SILT W/SOME CLAY, TRACE OF FINE GRAVEL.	A-4(0)	
	4.0				
4	4.0		WET BROWN CLAYEY COARSE TO FINE SANDY SILT W/TRACE FINE GRAVEL.	A-4(0)	
	6.0				
5	6.0	9	WET MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-2-4(0)	
		10			
		11			
	8.0	16			
6	8.0	14	NO SAMPLE		
		10			
		19			
	10.0	22			
7	10.0	7	WET MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/TRACE FINE GRAVEL.	A-2-4(0)	
		10			
		13			
	12.0	12			
8	12.0	10	WET MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/TRACE FINE GRAVEL AND CLAY.	A-2-4(0)	
		12			
		14			
	14.0	17			
9	14.0	7	WET MEDIUM DENSE BROWN CLAYEY COARSE TO FINE SAND AND FINE GRAVEL.	A-2-4(0)	
		12			
		15			
	16.0	19			
10	16.0	12	WET MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/SOME CLAY AND FINE GRAVEL.	A-2-4(0)	
		13			
		12			
	18.0	16			
11	18.0	9	WET MEDIUM DENSE BROWN CLAYEY COARSE TO FINE SAND W/SOME SILT, TRACE OF FINE GRAVEL.	A-2-4(0)	
		10			
		11			
	24.0	9			
12	24.0	8	WET MEDIUM DENSE BROWN COARSE SANDY FINE GRAVEL W/SOME FINE SAND AND SILT.	A-1-B	
		9			
		10			
	28.0	10			
13	28.0	6	NO SIEVE ANALYSIS - INDICATION OF WET MEDIUM DENSE COARSE SANDY FINE GRAVEL W/SOME FINE SAND AND SILT.		
		7			
		9			
	34.0	11			
14	34.0	20	WET DENSE BROWN COARSE SANDY FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-A	
		31			
		16			
	38.0	11			
15	38.0	50	WET DENSE BROWN COARSE TO FINE SAND AND FINE GRAVEL W/TRACE SILT.	A-1-B	
	44.0				
16	44.0	50	WET DENSE BROWN COARSE TO FINE SANDY FINE GRAVEL W/TRACE SILT.	A-1-B	
	48.0				
	48.0		END BORING		
	50.0				

BORING: LB-14 | **DATE DRILLED:** 6/22/15
STATION: | **OFFSET:** | **ELEVATION:** | **NORTHING:** 624171.1 | **EASTING:** 608435.3
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
1	0.0 0.0		MOIST BROWN COARSE TO FINE SANDY SILT W/SOME CLAY, TRACE OF FINE GRAVEL.	A-4(0)	
2	0.0 2.0		MOIST BROWN COARSE TO FINE SANDY SILT W/SOME CLAY, TRACE OF FINE GRAVEL.	A-4(0)	
3	2.0 4.0		MOIST BROWN CLAYEY COARSE TO FINE SANDY SILT W/TRACE FINE GRAVEL.	A-4(0)	
4	4.0 6.0		MOIST BROWN COARSE TO FINE SANDY SILT W/TRACE FINE GRAVEL.	A-4(0)	
5	6.0 8.0	10 15 13 14	MOIST MEDIUM DENSE BROWN CLAYEY COARSE TO FINE SAND W/SOME SILT, TRACE OF FINE GRAVEL.	A-2-4(0)	
6	8.0 10.0	9 11 13 17	MOIST VERY STIFF BROWN FINE TO COARSE SANDY SILT W/TRACE FINE GRAVEL AND CLAY.	A-4(0)	
7	10.0 12.0	16 24 16 14	MOIST DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-1-B	
8	12.0 14.0	16 39 42 50	MOIST VERY DENSE BROWN SILTY FINE TO COARSE SAND AND FINE GRAVEL.	A-1-B	
9	14.0 16.0	7 9 9 8	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/TRACE FINE GRAVEL.	A-2-4(0)	
10	16.0 18.0	5 10 9 9	MOIST MEDIUM DENSE BROWN COARSE TO FINE SAND W/SOME SILT, TRACE OF FINE GRAVEL.	A-1-B	
11	18.0 24.0	7 14 11 9	MOIST MEDIUM DENSE BROWN FINE GRAVEL AND COARSE SAND W/SOME FINE SAND, TRACE OF FINE GRAVEL.	A-1-B	
12	24.0 28.0	36 50	WET VERY DENSE BROWN COARSE TO FINE SAND W/TRACE FINE GRAVEL AND SILT.	A-1-B	
13	28.0 34.0	6 8 9 9	WET MEDIUM DENSE BROWN FINE TO COARSE SANDY FINE GRAVEL W/TRACE SILT.	A-1-A	
14	34.0 38.0	8 9 7 6	WET MEDIUM DENSE BROWN COARSE TO FINE SAND AND FINE GRAVEL W/TRACE SILT.	A-1-B	
15	38.0 44.0	11 16 20 10	WET DENSE BROWN SILTY FINE GRAVEL W/TRACE FINE TO COARSE SAND.	A-1-B	
16	44.0 48.0	38 50	WET VERY DENSE BROWN COARSE TO FINE SAND AND FINE GRAVEL W/SOME SILT.	A-1-B	
	48.0 50.0		END BORING		

BORING: LB-15 | **DATE DRILLED:** 6/23/15
STATION: | **OFFSET:** | **ELEVATION:** | **NORTHING:** 625764.820 | **EASTING:** 609957.478
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
1	0.0 0.0		NO SAMPLE		
2	0.0 2.0	6 7 6 7	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL AND CLAY.	A-2-4(0)	
3	2.0 4.0	4 6 8 9	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/SOME CLAY, TRACE OF FINE GRAVEL.	A-2-4(0)	
4	4.0 6.0	10 10 11 10	MOIST VERY STIFF BROWN COARSE TO FINE SANDY SILT W/TRACE FINE GRAVEL.	A-4(0)	
5	6.0 8.0	4 5 4 5	MOIST STIFF BROWN COARSE TO FINE SANDY SILT W/TRACE FINE GRAVEL AND CLAY.	A-4(0)	
6	8.0 10.0	4 5 4 15	MOIST STIFF BROWN COARSE TO FINE SANDY SILT W/TRACE FINE GRAVEL AND CLAY.	A-4(0)	
7	10.0 12.0	5 19 19 14	MOIST DENSE BROWN SILTY COARSE SAND W/SOME FINE SAND AND FINE GRAVEL.	A-1-B	
8	12.0 14.0	3 11 12 9	MOIST VERY STIFF BROWN COARSE TO FINE SANDY SILT W/TRACE FINE GRAVEL AND CLAY.	A-4(0)	
9	14.0 16.0	12 20 22 23	MOIST DENSE BROWN COARSE TO FINE SAND W/SOME SILT, TRACE OF FINE GRAVEL.	A-1-B	
10	16.0 18.0	6 9 12 13	MOIST MEDIUM DENSE BROWN COARSE TO FINE SAND W/SOME SILT, TRACE OF FINE GRAVEL.	A-1-B	
11	18.0 24.0	12 15 14 17	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND AND FINE GRAVEL.	A-1-B	

BORING: LB-15 CONT.

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
12	24.0 29.0	12 7 6 5	NO SIEVE ANALYSIS - INDICATION OF MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.		
13	29.0 34.0	7 7 8 9	MOIST MEDIUM DENSE BROWN FINE GRAVEL W/SOME COARSE SAND, TRACE OF FINE SAND AND SILT.	A-1-A	
14	34.0 39.0	5 10 11 8	MOIST MEDIUM DENSE BROWN FINE GRAVEL W/SOME COARSE SAND, TRACE OF FINE SAND AND SILT.	A-1-A	
15	39.0 44.0	5 11 12 17	MOIST MEDIUM DENSE BROWN FINE GRAVEL W/TRACE COARSE TO FINE SAND AND SILT.	A-1-A	
16	44.0 49.0	12 17 11 12	MOIST MEDIUM DENSE BROWN FINE GRAVEL W/TRACE COARSE TO FINE SAND AND SILT.	A-1-A	
17	49.0 53.0	14 12 11 11	MOIST MEDIUM DENSE BROWN FINE GRAVEL W/TRACE COARSE TO FINE SAND.	A-1-A	
	53.0 55.0		END BORING		

BORING: LB-16 | **DATE DRILLED:** 6/23/15
STATION: | **OFFSET:** | **ELEVATION:** | **NORTHING:** 625297.143 | **EASTING:** 609515.891
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
1	0.0 2.0	3 3 3 3	MOIST LOOSE BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL AND SILT.	A-1-B	
2	2.0 4.0	2 4 2 3	MOIST LOOSE BROWN COARSE TO FINE SAND W/SOME SILT AND FINE GRAVEL.	A-1-B	
3	4.0 6.0	2 3 3 4	MOIST LOOSE BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL AND SILT.	A-1-B	
4	6.0 8.0	5 7 8 9	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/TRACE FINE GRAVEL.	A-2-4(0)	
5	8.0 10.0	8 9 10 13	MOIST MEDIUM DENSE BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL AND SILT.	A-1-B	
6	10.0 12.0	5 7 11 16	MOIST MEDIUM DENSE BROWN FINE GRAVELLY COARSE TO FINE SAND W/SOME SILT.	A-1-B	
7	12.0 14.0	8 9 16 13	MOIST MEDIUM DENSE BROWN FINE GRAVELLY COARSE SAND W/SOME FINE SAND AND SILT.	A-1-B	
8	14.0 16.0	9 10 12 16	MOIST MEDIUM DENSE BROWN FINE GRAVELLY COARSE SAND W/SOME FINE SAND AND SILT.	A-1-B	
9	16.0 18.0	3 4 3 3	MOIST LOOSE BROWN FINE CLAYEY COARSE SAND W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
10	18.0 24.0	4 5 9 6	MOIST MEDIUM DENSE BROWN FINE GRAVEL AND COARSE SAND W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
11	24.0 28.0	3 4 3 3	MOIST LOOSE BROWN COARSE SANDY FINE GRAVEL W/TRACE FINE SAND AND SILT.	A-1-A	
12	28.0 34.0	9 11 16 26	MOIST MEDIUM DENSE BROWN COARSE SANDY FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-A	
13	34.0 38.0	7 9 13 15	MOIST MEDIUM DENSE BROWN FINE GRAVEL AND COARSE TO FINE SAND W/TRACE SILT.	A-1-B	
14	38.0 44.0	16 24 38 31	MOIST VERY DENSE BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
15	44.0 48.0	10 13 17 15	MOIST DENSE BROWN COARSE TO FINE SAND AND FINE GRAVEL W/TRACE SILT.	A-1-B	
16	48.0 54.0	11 13 13 17	MOIST MEDIUM DENSE BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL AND SILT.	A-1-B	
17	54.0 58.0	50	NO RECOVERY		
	58.0 60.0		END BORING		

BORING: LB-17 | **DATE DRILLED:** 6/2/15
STATION: | **OFFSET:** | **ELEVATION:** | **NORTHING:** 624832 | **EASTING:** 609074.4
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
1	0.0 0.0		MOIST BROWN SILTY COARSE TO FINE SAND AND FINE GRAVEL.	A-1-B	
2	0.0 2.0		MOIST BROWN CLAYEY COARSE TO FINE SANDY SILT W/SOME FINE GRAVEL.	A-4(0)	
3	2.0 4.0		MOIST BROWN SILTY COARSE SAND W/SOME FINE SAND AND FINE GRAVEL.	A-1-B	
4	4.0 6.0	3 10 20 14	MOIST MEDIUM DENSE BROWN SILTY COARSE SAND AND FINE GRAVEL W/SOME FINE SAND.	A-1-B	
5	6.0 8.0	5 10 12 11	MOIST MEDIUM DENSE BROWN FINE TO COARSE SAND AND FINE GRAVEL W/SOME SILT.	A-1-B	
6	8.0 10.0	12 9 8 7	MOIST MEDIUM DENSE BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
7	10.0 12.0	4 3 2 2	MOIST LOOSE BROWN COARSE SANDY FINE GRAVEL W/SOME FINE SAND AND SILT.	A-1-A	
8	12.0 14.0	3 2 1 1	MOIST VERY LOOSE BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND AND SILT.	A-1-B	
9	14.0 16.0	1 1 1 2	MOIST VERY LOOSE BROWN COARSE SAND AND FINE GRAVEL W/TRACE FINE SAND AND SILT.	A-1-B	
10	16.0 18.0	1 1 3 2	MOIST VERY LOOSE BROWN COARSE SAND AND FINE GRAVEL W/TRACE FINE SAND AND SILT.	A-1-B	
11	18.0 24.0	2 4 5 4	MOIST LOOSE BROWN FINE GRAVEL FINE GRAVEL W/SOME COARSE TO FINE SAND, TRACE OF SILT.	A-1-A	
12	24.0 29.0	4 7 11 23	MOIST MEDIUM BROWN COARSE SANDY FINE GRAVEL W/TRACE FINE SAND AND SILT.	A-1-A	
13	29.0 34.0	4 9 15 15	WET BROWN FINE SANDY SILT W/SOME CLAY, TRACE OF COARSE SAND.	A-4(0)	
14	34.0 39.0	4 6 9 12	WET MEDIUM DENSE RED SILTY CLAY W/SOME FINE SAND, TRACE OF COARSE SAND.	A-7-6(16)	
15	39.0 44.0	3 5 7 5	WET STIFF RED SILTY FINE SANDY CLAY W/TRACE COARSE SAND.	A-6(5)	
U-1	44.0 46.0				
16	46.0 48.0	5 11 16 15	WET VERY STIFF RED CLAYEY FINE SANDY SILT W/TRACE COARSE SAND AND FINE GRAVEL.	A-4(3)	
17	48.0 53.0	5 8 10 17	WET MEDIUM DENSE RED SILTY FINE SAND W/TRACE COARSE SAND.	A-2-4(0)	
	53.0 55.0		END BORING		

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DELAWARE DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

NONE

I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS

CONTRACT	BRIDGE NO.	N/A
T201509002	DESIGNED BY: WRA	
COUNTY	CHECKED BY: WRA	
NEW CASTLE		

BORING LOG

BO-04

SHEET NO.	TOTAL SHTS.
25	26

BORING: LB-18 **DATE DRILLED:** 6/24/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 624492.9 **EASTING:** 608637.5
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
1	0.0		MOIST BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-2-4(0)	
	0.0				
2	0.0		MOIST BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-2-4(0)	
	2.0				
3	2.0		MOIST BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-2-4(0)	
	4.0				
4	4.0		MOIST BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-2-4(0)	
	6.0				
5	6.0	11	MOIST DENSE BROWN COARSE TO FINE SAND AND FINE GRAVEL W/SOME SILT.	A-1-B	
		22			
		26			
	8.0	19			
6	8.0	7	MOIST MEDIUM DENSE BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
		9			
		15			
	10.0	13			
7	10.0	5	WET MEDIUM DENSE BROWN FINE GRAVELLY COARSE TO FINE SAND W/TRACE SILT.	A-1-B	
		7			
		6			
	12.0	6			
8	12.0	9	WET MEDIUM DENSE BROWN COARSE SAND W/SOME FINE SAND AND FINE GRAVEL, TRACE OF SILT.	A-1-B	
		11			
		16			
	14.0	14			
9	14.0	50	WET VERY DENSE BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL, TRACE OF SILT.	A-1-B	
	16.0				
10	16.0	50	WET VERY DENSE BROWN FINE TO COARSE SAND AND FINE GRAVEL W/TRACE SILT.	A-1-B	
	18.0				
11	18.0	8	WET MEDIUM DENSE BROWN COARSE TO FINE SAND AND FINE GRAVEL W/TRACE SILT.	A-1-B	
		6			
		6			
	24.0	9			
12	24.0	9	WET MEDIUM DENSE BROWN FINE GRAVEL W/SOME COARSE SAND, TRACE OF FINE SAND AND SILT.	A-1-A	
		8			
		11			
	28.0	10			
13	28.0	18	WET MEDIUM DENSE BROWN COARSE SAND AND FINE GRAVEL W/TRACE FINE SAND AND SILT.	A-1-B	
		16			
		12			
	34.0	13			
14	34.0	7	WET VERY STIFF BROWN SILTY FINE SANDY CLAY W/TRACE COARSE SAND.	A-6(5)	
		9			
		16			
	38.0	11			
15	38.0	16	WET HARD BROWN CLAYEY FINE SANDY SILT W/TRACE COARSE SAND.	A-4(1)	
		23			
		19			
	44.0	16			
16	44.0	11	WET MEDIUM DENSE BROWN SILTY FINE SAND W/TRACE COARSE SAND.	A-2-4(0)	
		14			
		15			
	48.0	19			
	48.0		END BORING		
	50.0				

BORING: LB-19 **DATE DRILLED:** 6/24/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 624024.952 **EASTING:** 608053.742
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
1	0.0	3	MOIST MEDIUM DENSE BROWN SILTY COARSE SAND AND FINE GRAVEL W/SOME FINE SAND AND CLAY.	A-1-B	
		12			
		9			
	0.0	16			
2	0.0	16	MOIST DENSE BROWN SILTY COARSE TO FINE SAND W/TRACE FINE GRAVEL AND CLAY.	A-2-4(0)	
		13			
		20			
	2.0	23			
3	2.0	6	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/TRACE FINE GRAVEL.	A-2-4(0)	
		11			
		13			
	4.0	10			
4	4.0	8	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL, TRACE OF CLAY.	A-2-4(0)	
		11			
		13			
	6.0	24			
5	6.0	2	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-1-B	
		11			
		14			
	8.0	16			
6	8.0	8	MOIST MEDIUM DENSE BROWN SILTY COARSE TO FINE SAND W/SOME FINE GRAVEL.	A-1-B	
		11			
		12			
	10.0	14			
7	10.0	14	MOIST MEDIUM DENSE BROWN SILTY COARSE SAND W/SOME FINE SAND, FINE GRAVEL AND CLAY.	A-2-4(0)	
		13			
		11			
	12.0	10			
8	12.0	6	WET MEDIUM DENSE BROWN FINE TO COARSE SAND W/SOME FINE GRAVEL, TRACE OF SILT.	A-1-B	
		11			
		15			
	14.0	18			
9	14.0	14	WET MEDIUM DENSE BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL, TRACE OF SILT.	A-1-B	
		15			
		14			
	16.0	15			
10	16.0	1	SATURATED SOFT BLACK ORGANIC SILTY CLAY W/TRACE FINE TO COARSE SAND.	A-7-5(20)	
		2			
		2			
	18.0	5			
U-1	18.0		SATURATED BLACK ORGANIC SILTY CLAY W/ TRACE OF FINE TO COARSE SAND.	A-7-5(19)	
	22.0				

BORING: LB-19 CONT.

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
11	22.0	3	SATURATED FIRM BLACK ORGANIC SILTY CLAY W/TRACE COARSE TO FINE SAND.	A-7-5(17)	
		3			
		5			
	24.0	6			
12	24.0	1	SATURATED FIRM BLACK ORGANIC SILTY CLAY W/SOME COARSE SAND, TRACE OF FINE SAND.	A-7-5(21)	
		2			
		3			
	29.0	5			
U-2	29.0				
	32.0				
13	32.0	2	SATURATED FIRM BLACK ORGANIC SILTY CLAY W/TRACE FINE TO COARSE SAND.	A-7-5(19)	
		3			
		4			
	34.0	4			
14	34.0	2	SATURATED FIRM BLACK FINE SANDY SILT W/TRACE COARSE SAND AND FINE GRAVEL.	A-4(0)	
		3			
		4			
	39.0	5			
15	39.0	15	SATURATED VERY DENSE GRAY COARSE SANDY FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-A	
		25			
		30			
	44.0	38			
16	44.0	50	SATURATED DENSE GRAY FINE GRAVELLY COARSE SAND W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
	48.0				
	48.0		END BORING		
	50.0				

BORING: LB-20 **DATE DRILLED:** 6/29/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 625265.947 **EASTING:** 616513.597
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
1	0.0		MOIST GRAY SILTY COARSE SANDY FINE GRAVEL W/SOME FINE SAND AND CLAY.	A-2-4(0)	
	0.0				
2	0.0		WET GRAY COARSE SANDY SILT W/SOME FINE SAND, FINE GRAVEL AND CLAY.	A-4(0)	
	2.0				
3	2.0		WET GRAY FINE SANDY SILT W/SOME COARSE SAND AND CLAY, TRACE OF FINE GRAVEL.	A-4(0)	
	4.0				
4	4.0	1	WET FIRM BROWN CLAYEY FINE SANDY SILT W/SOME COARSE SAND, TRACE OF FINE GRAVEL.	A-4(1)	
		3			
		3			
	6.0	5			
5	6.0	5	WET VERY STIFF BROWN CLAYEY FINE TO COARSE SANDY SILT W/TRACE FINE GRAVEL.	A-4(1)	
		9			
		19			
	8.0	18			
6	8.0	7	WET VERY STIFF BROWN CLAYEY SILT W/TRACE FINE TO COARSE SAND AND FINE GRAVEL.	A-4(4)	
		11			
		12			
	10.0	14			
7	10.0	5	WET VERY STIFF BROWN SILT W/SOME CLAY, TRACE OF FINE SAND.	A-4(3)	
		9			
		11			
	12.0	17			
8	12.0	5	WET VERY STIFF BROWN CLAYEY SILT W/TRACE FINE TO COARSE SAND.	A-4(8)	
		12			
		15			
	14.0	15			
9	14.0	15	WET HARD BROWN CLAYEY SILT W/TRACE FINE TO COARSE SAND.	A-4(8)	
		24			
		38			
	16.0	27			
10	16.0	30	WET HARD BROWN SILT W/SOME CLAY, TRACE OF FINE TO COARSE SAND.	A-4(3)	
		28			
		35			
	18.0	41			
11	18.0	5	WET HARD BROWN SILT W/SOME CLAY, TRACE OF FINE TO COARSE SAND.	A-4(5)	
		8			
		11			
	24.0	12			
12	24.0	5	WET VERY STIFF BROWN CLAYEY SILT W/TRACE FINE TO COARSE SAND.	A-4(8)	
		7			
		11			
	29.0	13			
13	29.0	5	WET VERY STIFF GRAY CLAYEY SILT W/TRACE FINE SAND.	A-4(9)	
		8			
		13			
	34.0	19			
14	34.0	7	WET VERY STIFF GRAY SILTY CLAY W/TRACE FINE SAND.	A-7-5(19)	
		10			
		10			
	39.0	17			
15	39.0	9	WET VERY STIFF GRAY SILTY CLAY W/TRACE FINE TO COARSE SAND.	A-7-5(20)	
		10			
		17			
	44.0	18			
16	44.0	5	WET VERY STIFF GRAY CLAYEY FINE SANDY SILT W/TRACE COARSE SAND.	A-4(5)	
		10			
		14			
	48.0	17			
	48.0		END BORING		
	50.0				

BORING: LB-21 **DATE DRILLED:** 6/11/15
STATION: **OFFSET:** **ELEVATION:** **NORTHING:** 624820.9 **EASTING:** 616833.6
COMMENTS: N/A

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
1	0.0		MOIST BROWN COARSE SAND W/SOME FINE SAND, FINE GRAVEL AND SILT.	A-1-B	
	0.0				
2	0.0		MOIST BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL AND SILT.	A-1-B	
	2.0				
3	2.0		MOIST BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
	4.0				

BORING: LB-21 CONT.

NO.	DEPTH	BLOWS /6"	DESCRIPTION	CLASS /G.I.	REMARKS
		18			
	6.0	17			
5	6.0	7	MOIST MEDIUM DENSE BROWN FINE GRAVELLY COARSE SAND W/SOME FINE SAND AND SILT.	A-1-B	
		11			
		9			
	8.0	11			
6	8.0	6	MOIST MEDIUM DENSE BROWN COARSE SAND AND FINE GRAVEL W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
		6			
		6			
	10.0	6			
7	10.0	9	MOIST DENSE BROWN FINE GRAVELLY COARSE SAND W/SOME FINE SAND, TRACE OF SILT.	A-1-B	
		15			
		22			
	12.0	32			
8	12.0	4	WET MEDIUM DENSE BROWN FINE GRAVELLY FINE TO COARSE SAND, TRACE OF SILT.	A-1-B	
		10			
		12			
	14.0	16			
9	14.0	11	WET LOOSE BROWN COARSE TO FINE SAND W/SOME FINE GRAVEL, TRACE OF SILT.	A-1-B	
		13			
		7			
	16.0	11			
U-1	16.0		NO RECOVERY		
	18.0				
11	18.0	7	WET HARD RED SILTY CLAY W/TRACE FINE TO COARSE SAND.	A-6(14)	
		11			
		20			
	24.0	22			
12	24.0	7	WET VERY STIFF GRAY CLAYEY SILT W/SOME ORGANIC MATTER, TRACE OF FINE SAND.	A-4(11)	
		11			
		17			
	29.0	18			
U-2	29.0				
	32.0				
13	32.0	7	WET VERY STIFF GRAY CLAYEY SILT W/TRACE FINE TO COARSE SAND.	A-4(9)	
		13			
		14			
	34.0	17			
14	34.0	4	WET VERY STIFF GRAY SILTY CLAY W/TRACE FINE TO COARSE SAND.	A-6(11)	
		10			
		13			
	39.0	17			
15	39.0	6	WET HARD GRAY CLAYEY SILT W/SOME FINE SAND.	A-4(6)	
		13			
		20			
	44.0	24			
16	44.0	8	WET DENSE GRAY SILTY FINE SAND.	A-2-4(0)	
		9			
		23			
	49.0	25			
17	49.0	5	WET VERY STIFF RED SILTY CLAY W/TRACE FINE TO COARSE SAND.	A-7-6(21)	
		8			
		13			
	53.0	17			
	53.0		END BORING		
	55.0				

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DELAWARE DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

NONE

I-95/I-295/I-495 INTERSTATE HIGH MAST LIGHTING IMPROVEMENTS

CONTRACT T201509002
COUNTY NEW CASTLE
BRIDGE NO. N/A
DESIGNED BY: WRA
CHECKED BY: WRA

BORING LOG

BO-05
SHEET NO. 26
TOTAL SHTS. 26

APPENDIX J.
SAMPLE PLAN – UTILITY OWNED LIGHTING DESIGN

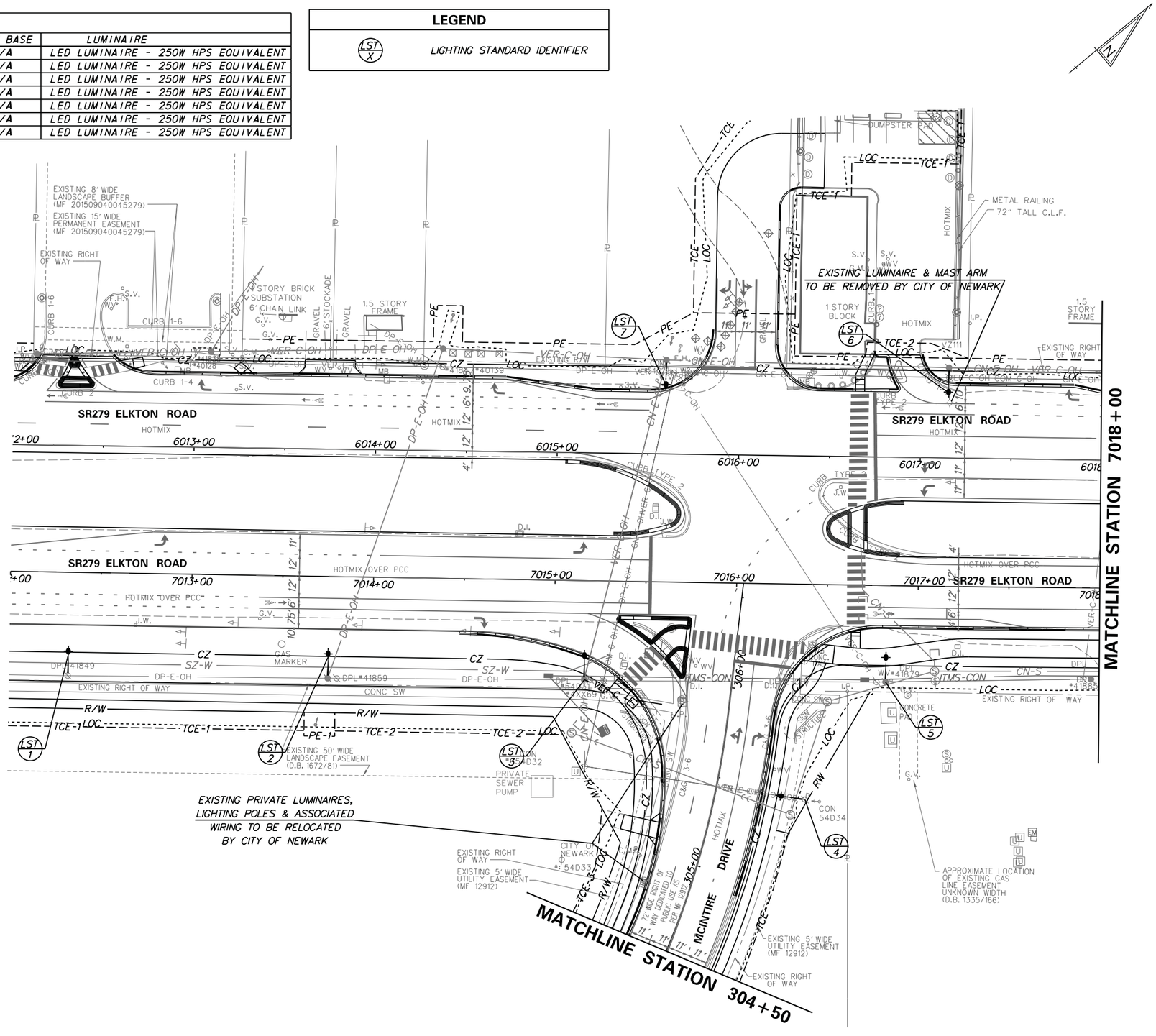
LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	STATION	OFFSET	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE
*1	N/A	7012+32	57' RT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*2	N/A	7013+76	56' RT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*3	N/A	7015+17	54' RT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*4	N/A	305+47	49' RT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*5	N/A	7016+83	53' RT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*6	N/A	6017+15	50' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*7	N/A	6015+60	52' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT

W = WATT
LED = LIGHT EMITTING DIODE
* = LIGHT TO BE INSTALLED BY CITY OF NEWARK

LEGEND

(LST X) — LIGHTING STANDARD IDENTIFIER



GENERAL NOTES:

1. ALL LIGHTING JUNCTION WELLS SHALL BE TYPE 11, UNLESS OTHERWISE NOTED.

2. EXISTING LIGHT POLES, DAVIT ARMS, AND LUMINAIRES BEING REMOVED SHALL BE SALVAGED AND DELIVERED TO DELDOT CANAL DISTRICT MAINTENANCE SHOP, 250 BEAR CHRISTIANA RD, BEAR, DELAWARE, UNLESS OTHERWISE NOTED.

3. LOCATION OF CONDUIT AND POLE MAY BE ADJUSTED IN FIELD TO AVOID EXISTING OR OTHER PROPOSED CONSTRUCTION FEATURES, SUBJECT TO APPROVAL OF THE ENGINEER. ALL CONDUITS AND POLES SHALL BE LOCATED WITHIN EXISTING/PROPOSED RIGHT-OF-WAY OR PERMANENT EASEMENT.

4. FOR FINAL CONNECTION TO LIGHT FIXTURES, AND LIGHT STANDARD AND FIXTURE DETAILS, SEE TYPICAL LUMINAIRE CONNECTION DETAILS ON LIGHTING DETAIL SHEET LI-14.

5. COORDINATE THE INSTALLATION OF ITMS MULTIDUCT CONDUIT AND LIGHTING CONDUIT IN TRENCHES. REFER TO SIGNING, STRIPING AND CONDUIT PLANS FOR ITMS DETAILS. ITMS AND LIGHTING CABLES SHALL NOT SHARE THE SAME CONDUIT OR JUNCTION WELL, UNLESS OTHERWISE NOTED.

6. UNLESS OTHERWISE NOTED, CONTRACTORS SHALL RUN UNSPLICED, CONTINUOUS CABLE FROM POINT OF SERVICE TO LIGHT POLE BASE, AND FROM LIGHT POLE BASE TO LIGHT POLE BASE.

7. FOR ACCESS TO DELDOT OWNED LIGHTING EQUIPMENT, CONTACT FRANK PEPPER (MONDAY TO FRIDAY, 8 AM TO 4 PM, 302-379-5313) AT THE CANAL DISTRICT FACILITY AT LEAST 48 HOURS IN ADVANCE.

8. BURIED ELECTRICAL CABLE AND CONDUIT, AND OTHER UTILITIES MAY EXIST THROUGHOUT THIS PROJECT. THE EXISTING UTILITY LOCATIONS SHOWN ON THE PLANS ARE APPROXIMATE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND PREVENTING DAMAGE TO THEM, AND MAINTAINING THEM IN SERVICE WHEN AND WHERE REQUIRED.

9. ALL LIGHTING CONDUIT ENDS IN JUNCTION WELLS AND POLE BASES SHALL BE SEALED WITH PEST DETERRING FOAM, THE TYPE OF WHICH SHALL BE SPECIFIED BY DELDOT TRAFFIC.

10. ALL THE EXISTING LIGHTING WITHIN THE PROJECT LIMITS MAY NOT BE MAINTAINED DURING CONSTRUCTION. LIGHTING WILL BE PROVIDED AS DESIGNED ONCE THE CONSTRUCTION IS COMPLETED.

11. THE REMOVAL OF EXISTING LIGHTING POLES, LIGHTING POLE BASES AND JUNCTION WELLS SHALL BE PAID UNDER ITEM 211000 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS. WHERE INDICATED ON THE PLANS TO REMOVE EXISTING LIGHTING STANDARDS, THIS SHALL INCLUDE REMOVAL OF THE EXISTING LIGHTING STANDARD AND FOUNDATION, UNLESS OTHERWISE NOTED. PAYMENT FOR REMOVAL OF EXISTING LUMINAIRES SHALL BE MADE UNDER ITEM #850011.

PLOTTED BY: LBERZINA DATE: 8/25/2017
FILE LOCATION: Q:\NDE\140659_007_ELKTON_RD_CASHO_MILL\CADD\LI.DGN [SHEET: LI01]

DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS	

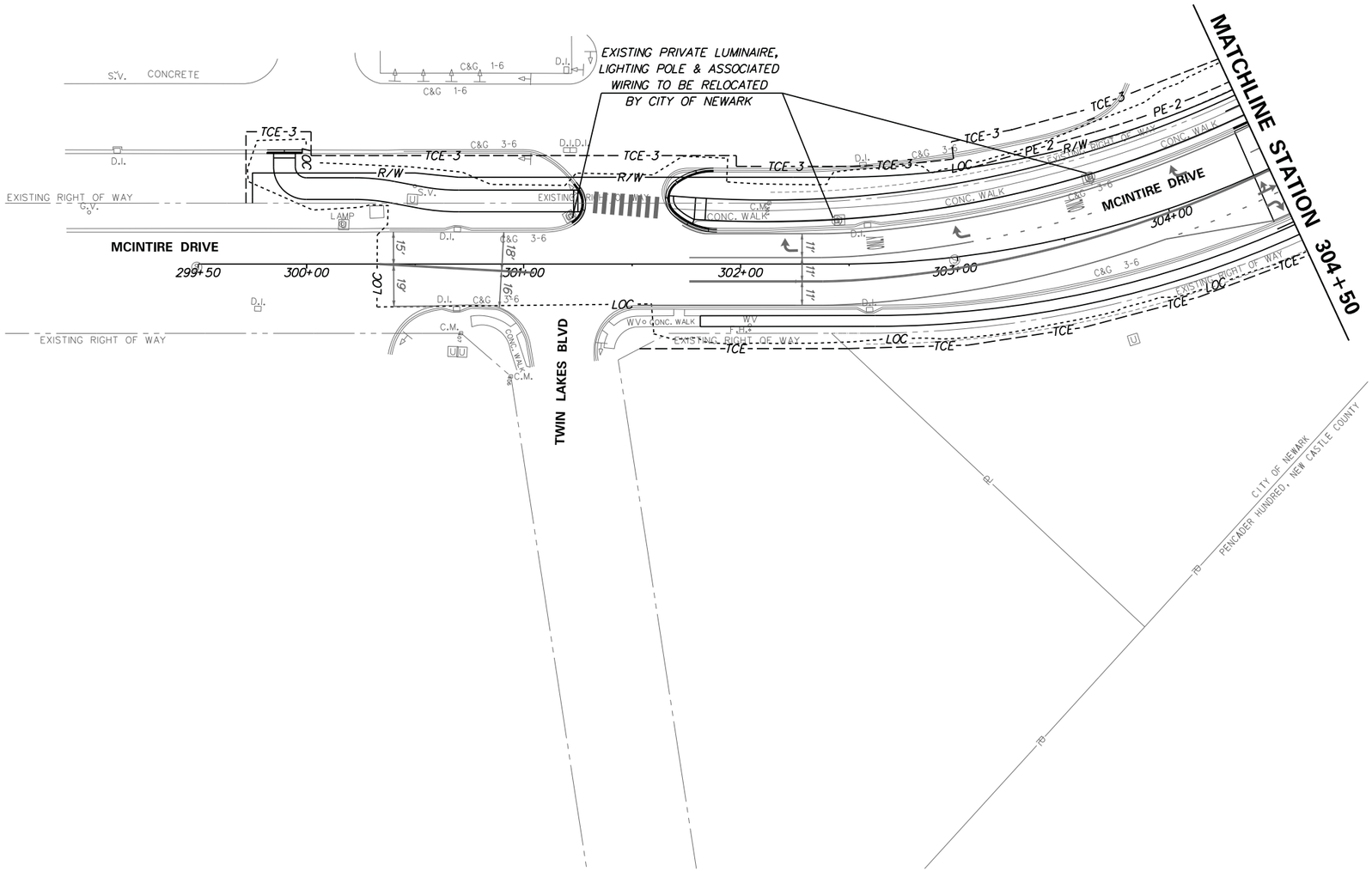
SCALE
0 30 60 90
FEET

ELKTON ROAD
MD LINE TO
CASHO MILL ROAD

CONTRACT	T201504401	BRIDGE NO.	1-322 1-322P 1-323 1-323P
COUNTY	NEW CASTLE	DESIGNED BY: GYB	
		CHECKED BY: MAW	

LIGHTING PLAN

LI-01	
SHEET NO.	321
TOTAL SHTS.	431



PLOTTED BY: LBERZINA DATE: 8/25/2017
FILE LOCATION: Q:\NDE\140659_007_ELKTON_RD_CASHO_MILL\CADD\LI.DGN [SHEET: LI02]

DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. 1-322 1-322P 1-323 1-323P	LIGHTING PLAN	LI-02
				COUNTY NEW CASTLE	DESIGNED BY: GYB		SHEET NO. 322
					CHECKED BY: MAW		TOTAL SHTS. 431

LIGHTING STANDARD SCHEDULE

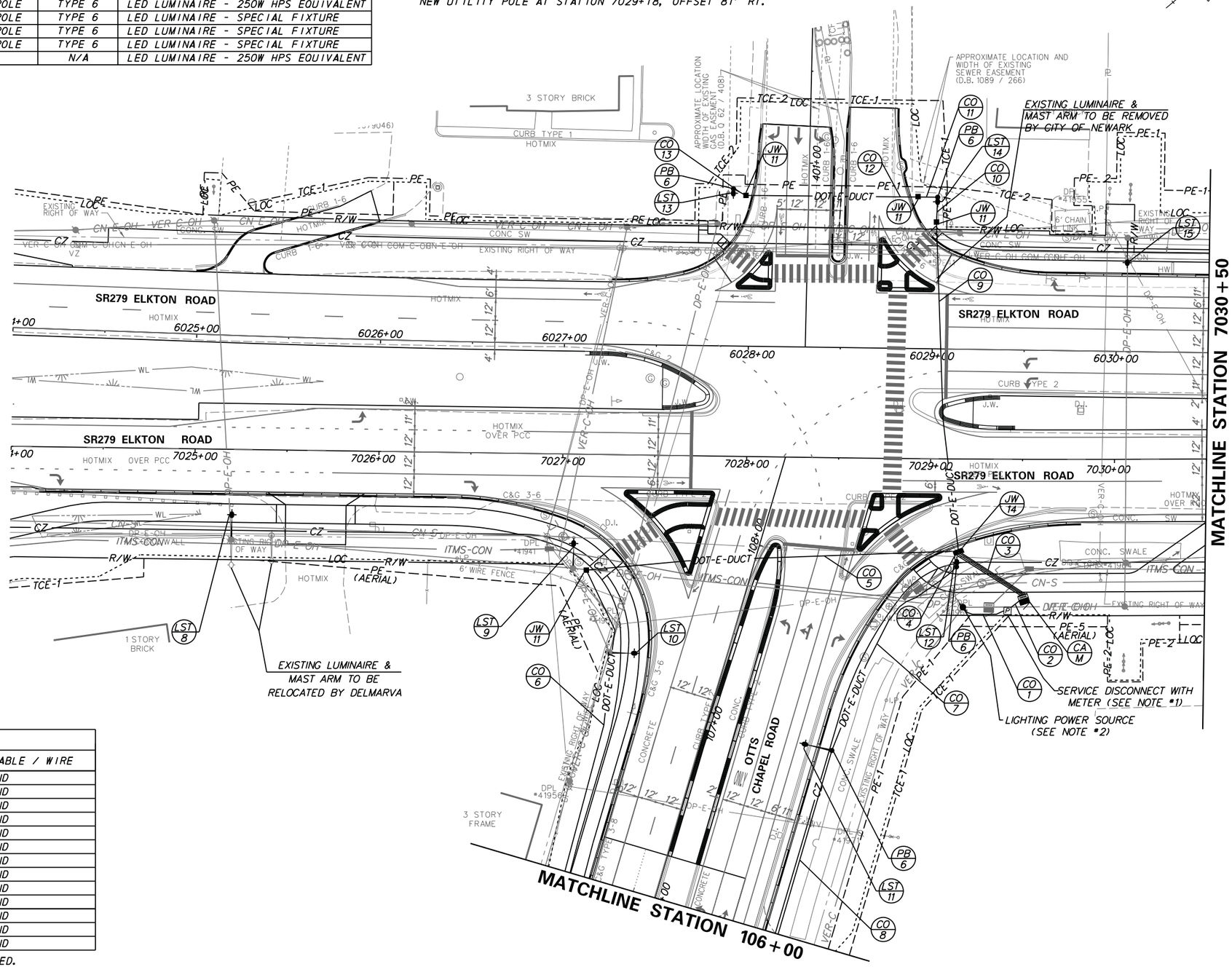
NO.	CIRCUIT NO.	STATION	OFFSET	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE
*8	N/A	7025+20	49' RT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*9	N/A	7027+06	62' RT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*10	N/A	107+21	61' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
11	1A1	107+04	69' RT	15'	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT
12	1B1	7029+14	59' RT	N/A	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - SPECIAL FIXTURE
13	1A1	400+85	41' LT	N/A	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - SPECIAL FIXTURE
14	1B1	400+83	70' RT	N/A	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - SPECIAL FIXTURE
*15	N/A	6030+05	62' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT

W = WATT
LED = LIGHT EMITTING DIODE
* = LIGHT TO BE INSTALLED BY CITY OF NEWARK

GENERAL NOTES:

1. INSTALL ELECTRICAL SERVICE ON PEDESTAL WITH 120/240V, SINGLE PHASE, THREE WIRE, 100 AMP ELECTRICAL SERVICE.

2. SECONDARY SERVICE FOR NEW LIGHTING POWER SOURCE TO BE ESTABLISHED BY DELMARVA AT NEW UTILITY POLE AT STATION 7029+18, OFFSET 81' RT.



LIGHTING SERVICE SCHEDULE

SERVICE RUN NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-1	1 (GALV. STEEL)	2.0"	25'	T	(3)#4 + (1)#4 GND
CO-2	1 (GALV. STEEL)	2.0"	15'	T	(3)#4 + (1)#4 GND
CO-3	4**	3.0"	45'	T	(3)#6 + (4)#6 GND
CO-4	1	3.0"	10'	T	(3)#6 + (1)#6 GND
CO-5	1 (SCH 80 HDPE)	4.0"	200'	B	(2)#6 + (1)#6 GND
CO-6	1	3.0"	190'	T	(2)#6 + (1)#6 GND
CO-7	1	3.0"	125'	T	(3)#6 + (1)#6 GND
CO-8	1	3.0"	195'	T	(3)#6 + (1)#6 GND
CO-9	1 (SCH 80 HDPE)	4.0"	180'	B	(3)#6 + (1)#6 GND
CO-10	1	3.0"	15'	T	(3)#6 + (1)#6 GND
CO-11	1	3.0"	15'	T	(3)#6 + (1)#6 GND
CO-12	1 (SCH 80 HDPE)	3.0"	95'	B	(2)#6 + (1)#6 GND
CO-13	1	4.0"	10'	T	(2)#6 + (1)#6 GND

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
B = BORE, T = TRENCH, O = OPEN CUT
** - A GROUND CABLE SHALL BE PLACED IN EACH INDIVIDUAL CONDUIT

PLOTTED BY: LBERZINA DATE: 8/25/2017
FILE LOCATION: Q:\NDE\140659_007_ELKTON_RD_CASHO_MILL\CADD\LI.DGN [SHEET: LI03]

DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE
0 30 60 90
FEET

ELKTON ROAD
MD LINE TO
CASHO MILL ROAD

CONTRACT	BRIDGE NO.	1-322 1-322P 1-323 1-323P
T201504401	DESIGNED BY: GYB	
COUNTY	CHECKED BY: MAW	
NEW CASTLE		

LIGHTING PLAN

LI-03	
SHEET NO.	323
TOTAL SHTS.	431

LIGHTING STANDARD SCHEDULE

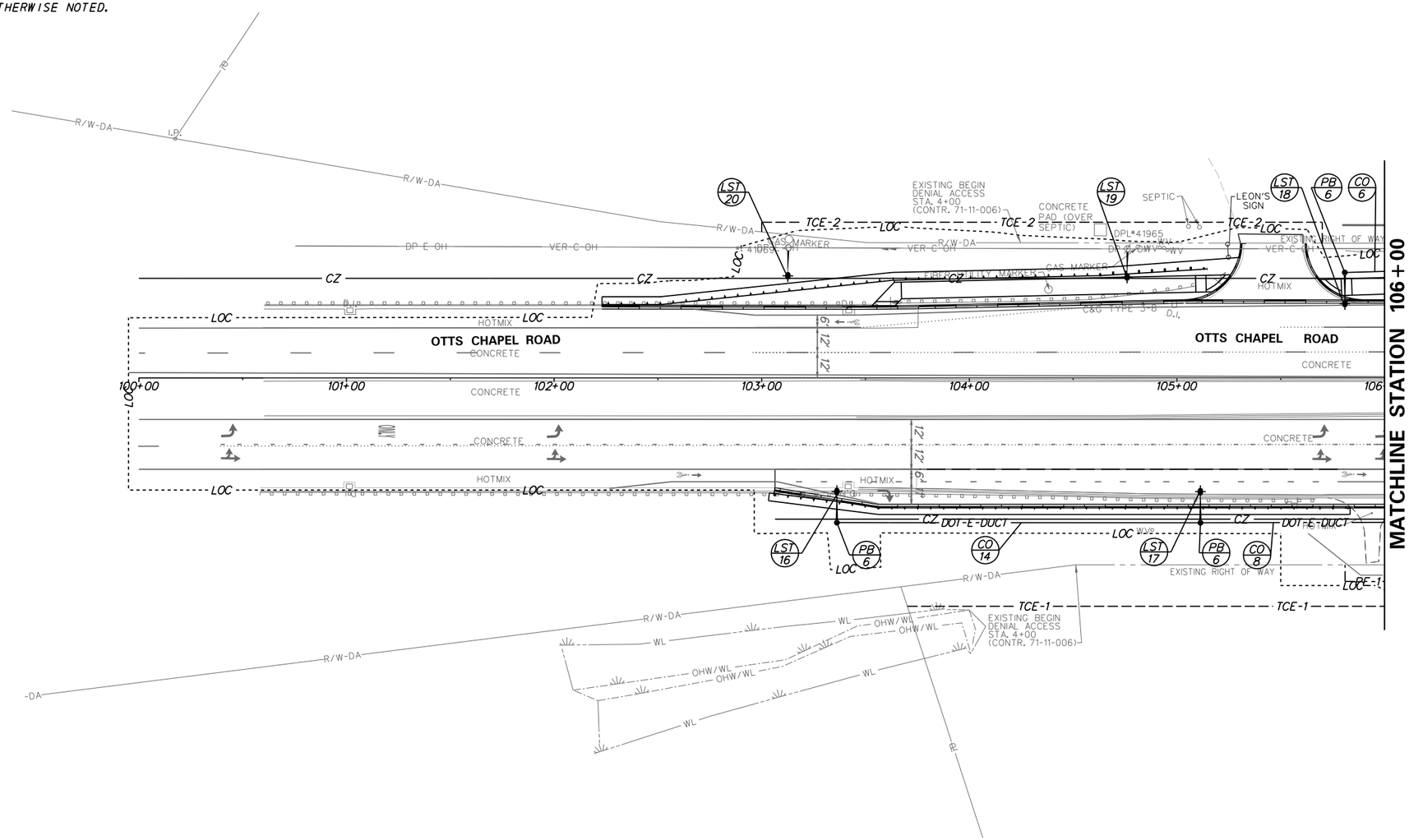
NO.	CIRCUIT NO.	STATION	OFFSET	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE
16	1A1	103+36	70' RT	15'	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT
17	1B1	105+11	70' RT	15'	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT
18	1A1	105+81	51' LT	15'	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT
*19	N/A	104+76	62' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*20	N/A	103+13	63' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT

W = WATT
LED = LIGHT EMITTING DIODE
* = LIGHT INSTALLED BY CITY OF NEWARK

LIGHTING SERVICE SCHEDULE

SERVICE RUN NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-6	INFORMATION PROVIDED ON SHEET LI-04				
CO-8	INFORMATION PROVIDED ON SHEET LI-04				
CO-14	1	3.0"	175'	T	(2)#2 + (1)#2 GND

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
B = BORE, T = TRENCH, O = OPEN CUT



DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE
0 30 60 90
FEET

ELKTON ROAD
MD LINE TO
CASHO MILL ROAD

CONTRACT	BRIDGE NO.	1-322 1-322P 1-323 1-323P
T201504401	DESIGNED BY: GYB	
COUNTY	CHECKED BY: MAW	
NEW CASTLE		

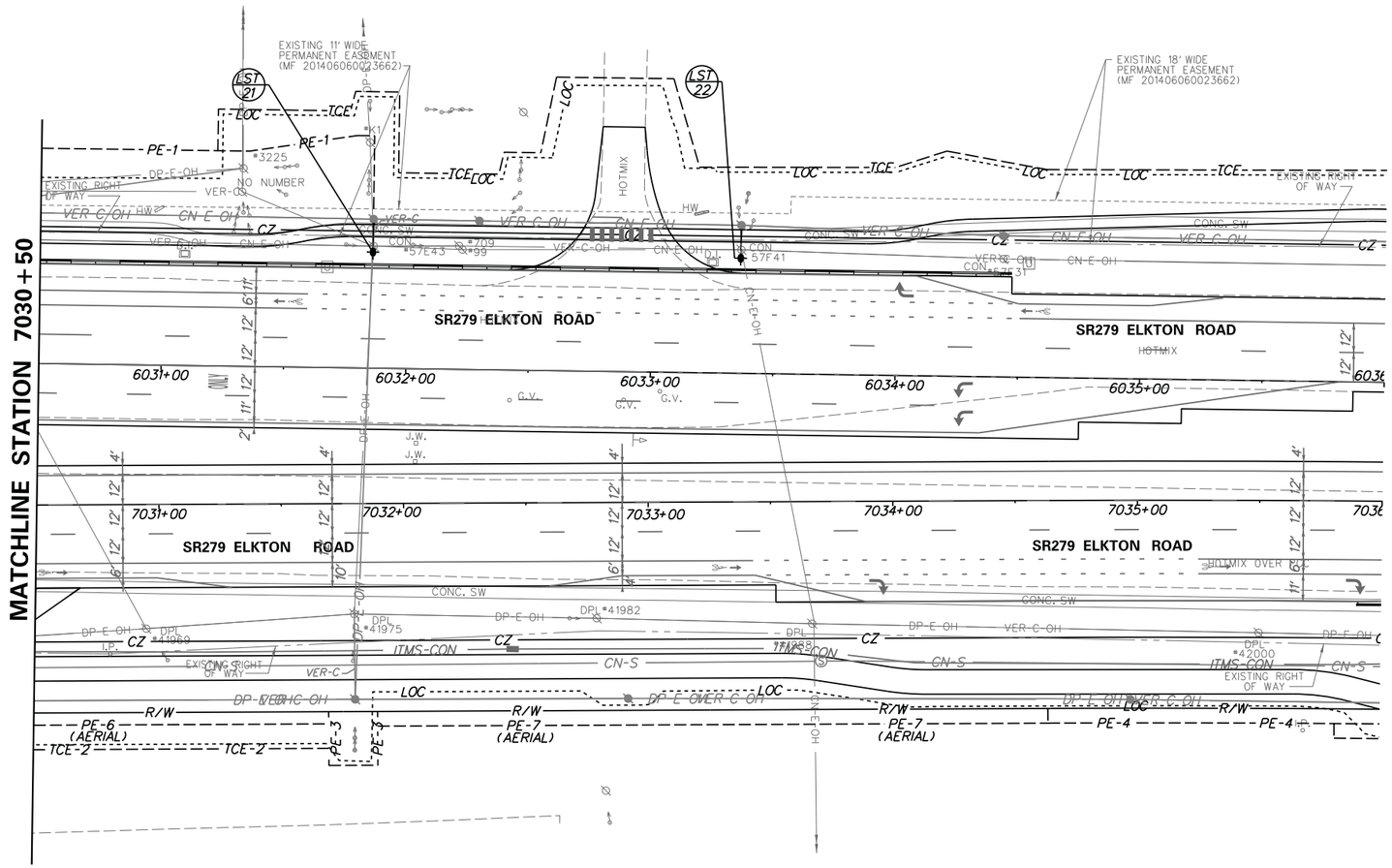
LIGHTING PLAN

LI-04	
SHEET NO.	324
TOTAL SHTS.	431

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	STATION	OFFSET	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE
*21	N/A	6031+86	61' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*22	N/A	6033+36	61' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT

W = WATT
LED = LIGHT EMITTING DIODE
* = LIGHT TO BE INSTALLED BY CITY OF NEWARK



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FILE LOCATION: Q:\NDE\140659_007_ELKTON_RD_CASHO_MILL\CADD\LI.DGN [SHEET: LI05]

DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

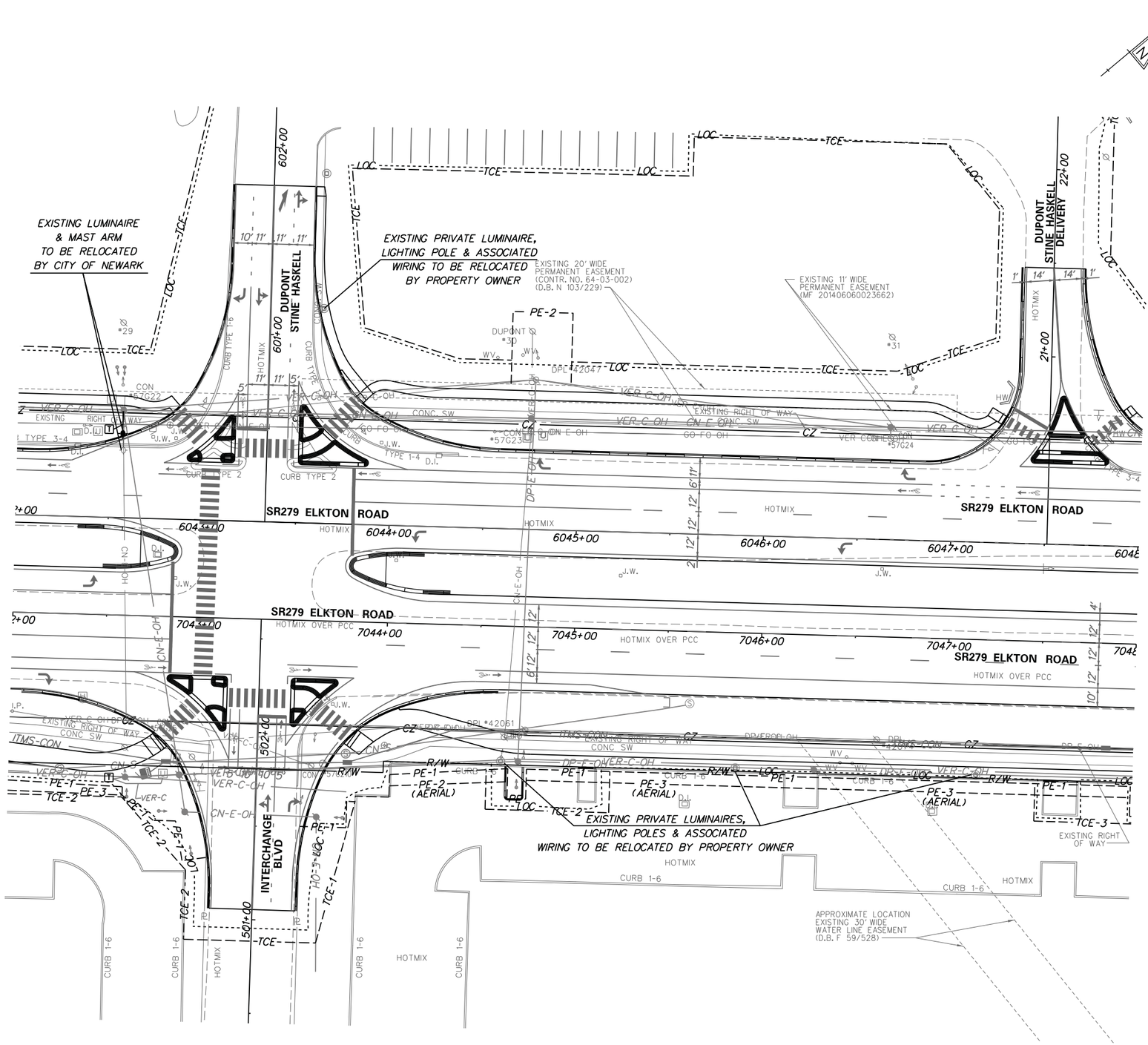
SCALE
0 30 60 90
FEET

ELKTON ROAD
MD LINE TO
CASHO MILL ROAD

CONTRACT	BRIDGE NO.	1-322 1-322P 1-323 1-323P
T201504401	DESIGNED BY: GYB	
COUNTY	CHECKED BY: MAW	
NEW CASTLE		

LIGHTING PLAN

LI-05
SHEET NO. 325
TOTAL SHTS. 431



PLOTTED BY: LBERZINA DATE: 8/25/2017
FILE LOCATION: Q:\NDE\140659_007_ELKTON_RD_CASHO_MILL\CADD\LI.DGN [SHEET: LI06]

DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. 1-322 1-322P 1-323 1-323P	LIGHTING PLAN	LI-06
				COUNTY NEW CASTLE	DESIGNED BY: GYB		SHEET NO. 326
					CHECKED BY: MAW		TOTAL SHTS. 431

LIGHTING STANDARD SCHEDULE

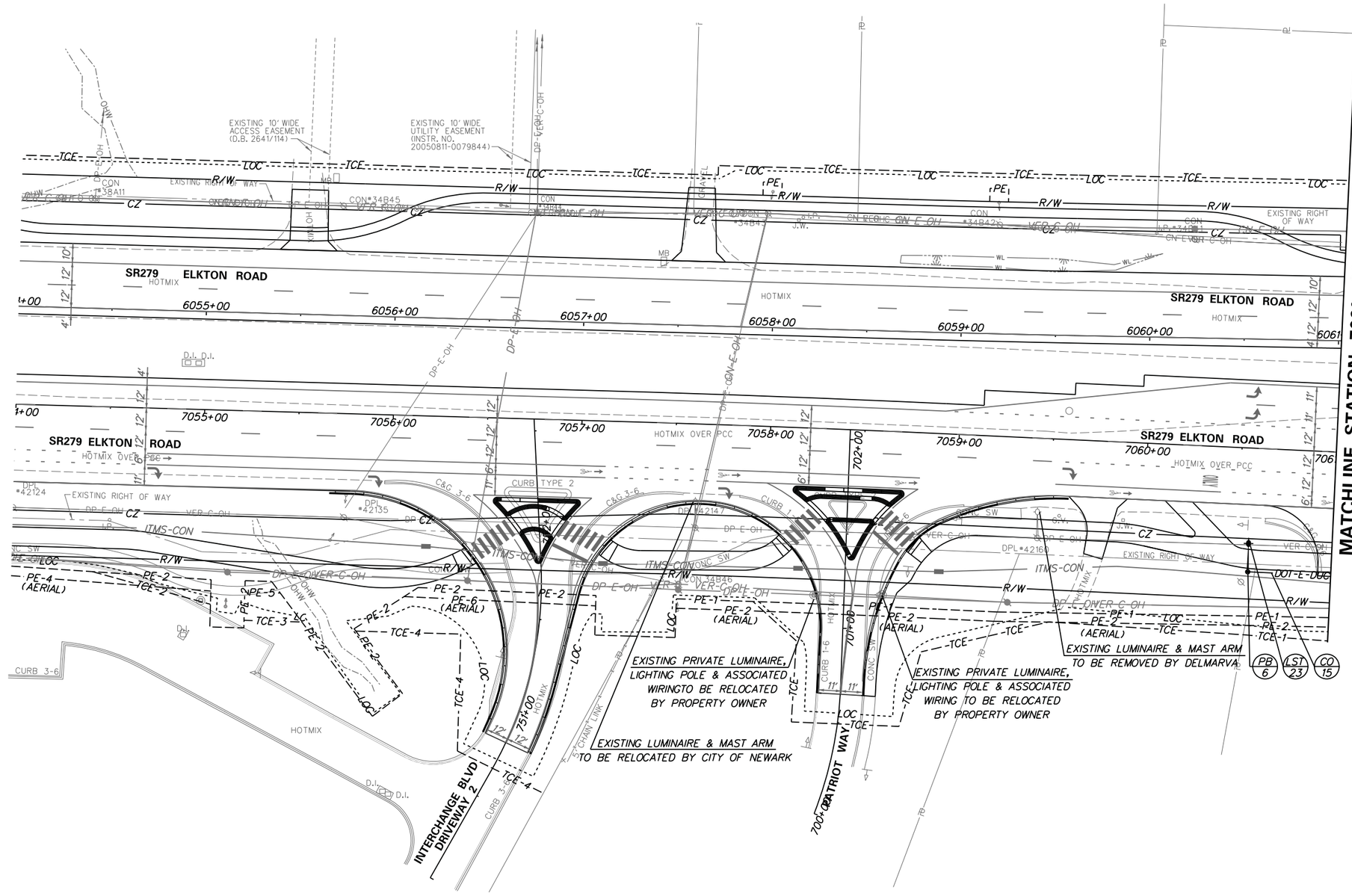
NO.	CIRCUIT NO.	STATION	OFFSET	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE
23	2B1	7060+56	66' RT	15'	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT

W = WATT
LED = LIGHT EMITTING DIODE

LIGHTING SERVICE SCHEDULE

SERVICE RUN NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-15	1	3.0"	185'	O	(2)#6 + (1)#6 GND

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
B = BORE, T = TRENCH, O = OPEN CUT



PLOTTED BY: LBERZINA DATE: 8/25/2017
FILE LOCATION: Q:\NDE\140659_007_ELKTON_RD_CASHO_MILL\CADD\LI.DGN [SHEET: LI07]

DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE
0 30 60 90
FEET

ELKTON ROAD
MD LINE TO
CASHO MILL ROAD

CONTRACT	BRIDGE NO.	1-322 1-322P 1-323 1-323P
T201504401	DESIGNED BY: GYB	
COUNTY	CHECKED BY: MAW	
NEW CASTLE		

LIGHTING PLAN

LI-07	
SHEET NO.	327
TOTAL SHTS.	431

LIGHTING STANDARD SCHEDULE

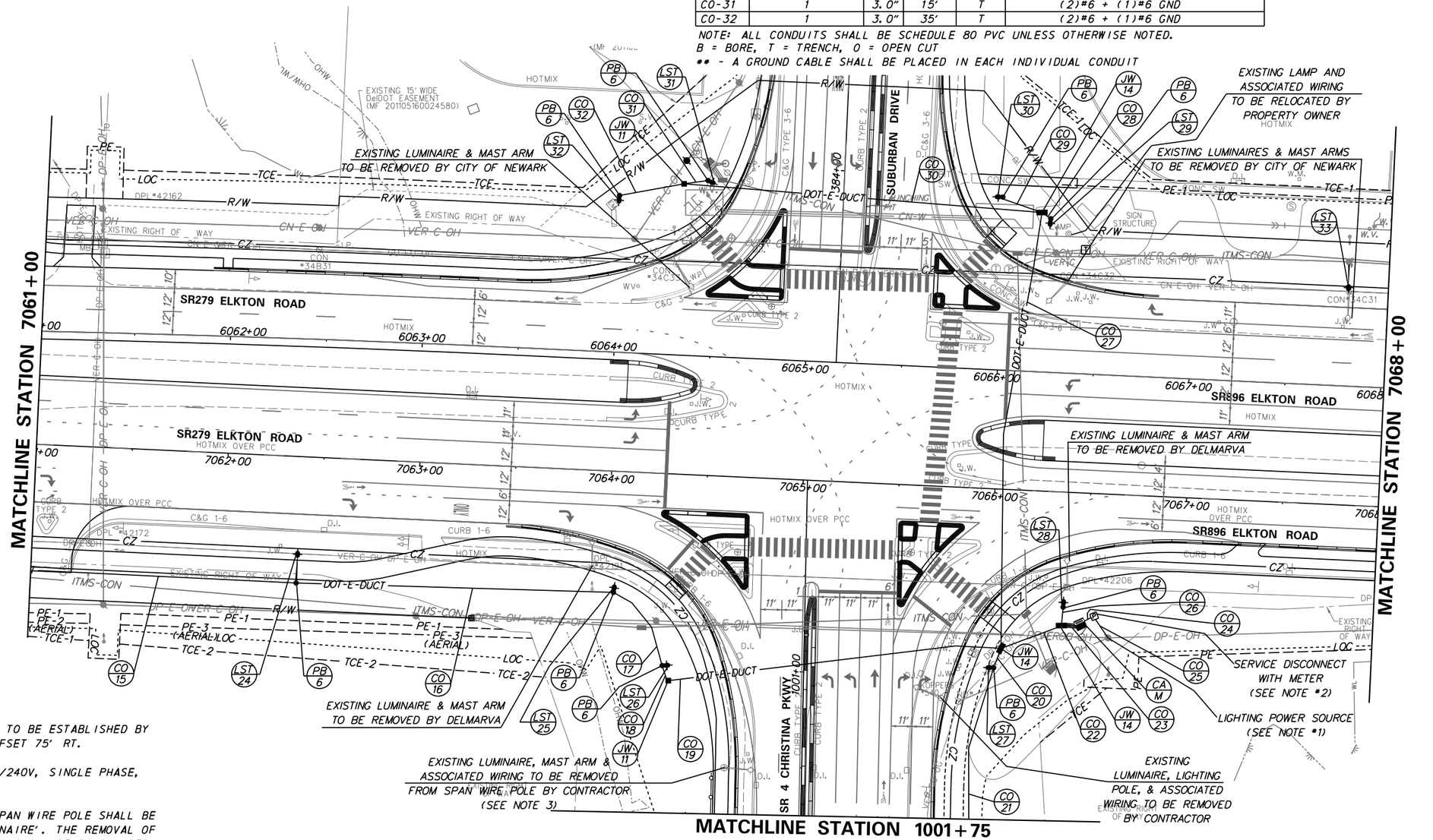
NO.	CIRCUIT NO.	STATION	OFFSET	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE
24	2A1	7062+38	66' RT	15'	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT
25	2B1	7064+04	63' RT	N/A	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - SPECIAL FIXTURE
26	2A1	1000+98	76' RT	N/A	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - SPECIAL FIXTURE
27	2B1	1000+97	99' LT	N/A	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - SPECIAL FIXTURE
28	2A1	7066+38	60' RT	N/A	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - SPECIAL FIXTURE
29	2A1	6066+24	80' LT	N/A	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - SPECIAL FIXTURE
30	2B1	384+11	83' LT	N/A	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - SPECIAL FIXTURE
31	2A1	384+08	71' RT	N/A	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - SPECIAL FIXTURE
32	2B1	6063+99	82' LT	N/A	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - SPECIAL FIXTURE
*33	N/A	6067+80	65' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT

W = WATT
LED = LIGHT EMITTING DIODE
* = LIGHT INSTALLED BY CITY OF NEWARK

LIGHTING SERVICE SCHEDULE

SERVICE RUN NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-15	INFORMATION PROVIDED ON SHEET LI-08				
CO-16	1	3.0"	170'	T	(3)#6 + (1)#6 GND
CO-17	1	3.0"	50'	T	(3)#6 + (1)#6 GND
CO-18	1	3.0"	10'	T	(3)#6 + (1)#6 GND
CO-19	1 (SCH 80 HDPE)	4.0"	175'	B	(3)#6 + (1)#6 GND
CO-20	1	3.0"	15'	T	(3)#6 + (1)#6 GND
CO-21	1	3.0"	185'	T	(2)#6 + (1)#6 GND
CO-22	1	4.0"	50'	T	(3)#6 + (1)#6 GND
CO-23	4**	2.5"	10'	T	(3)#6 + (4)#6 GND
CO-24	1 (GALV. STEEL)	2.0"	10'	T	(3)#2 + (1)#2 GND
CO-25	1 (GALV. STEEL)	2.0"	15'	T	(3)#2 + (1)#2 GND
CO-26	1	3.0"	15'	T	(2)#6 + (1)#6 GND
CO-27	1 (SCH 80 HDPE)	4.0"	225'	B	(3)#6 + (1)#6 GND
CO-28	1	3.0"	20'	T	(2)#6 + (1)#6 GND
CO-29	1	3.0"	30'	T	(2)#6 + (1)#6 GND
CO-30	1 (SCH 80 HDPE)	4.0"	195'	B	(3)#6 + (1)#6 GND
CO-31	1	3.0"	15'	T	(2)#6 + (1)#6 GND
CO-32	1	3.0"	35'	T	(2)#6 + (1)#6 GND

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
B = BORE, T = TRENCH, O = OPEN CUT
** - A GROUND CABLE SHALL BE PLACED IN EACH INDIVIDUAL CONDUIT



NOTES:

1. SECONDARY SERVICE FOR NEW LIGHTING POWER SOURCE TO BE ESTABLISHED BY DELMARVA AT NEW UTILITY POLE AT STATION 7066+63, OFFSET 75' RT.

2. INSTALL ELECTRICAL SERVICE ON PEDESTAL WITH 120/240V, SINGLE PHASE, THREE WIRE, 100 AMP ELECTRICAL SERVICE.

3. THE REMOVAL OF THE EXISTING LUMINAIRE FROM THE SPAN WIRE POLE SHALL BE PAID UNDER ITEM #850011 - 'REMOVAL OF EXISTING LUMINAIRE'. THE REMOVAL OF THE EXISTING LIGHTING MAST ARM AND ASSOCIATED WIRING SHALL BE PAID UNDER ITEM #211000 - 'REMOVAL OF STRUCTURES AND OBSTRUCTIONS'.

DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE
0 30 60 90
FEET

ELKTON ROAD
MD LINE TO
CASHO MILL ROAD

CONTRACT	BRIDGE NO.	1-322 1-322P 1-323 1-323P
T201504401	DESIGNED BY: GYB	
COUNTY	CHECKED BY: MAW	
NEW CASTLE		

LIGHTING PLAN

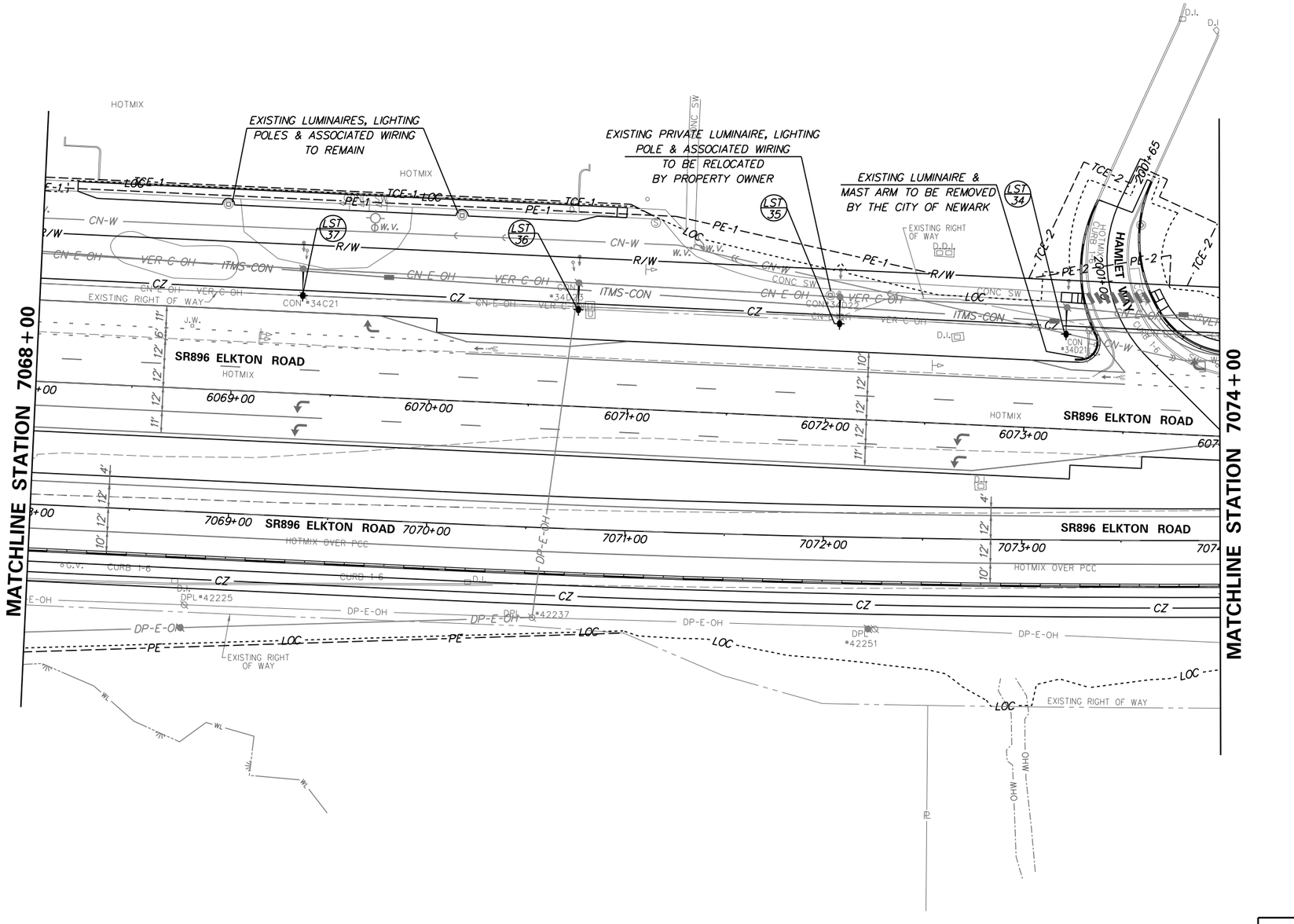
LI-08

SHEET NO.	TOTAL SHTS.
328	431

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	STATION	OFFSET	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE
*34	N/A	6073+19	61' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*35	N/A	6072+05	61' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*36	N/A	6070+73	62' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*37	N/A	6069+34	63' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT

W = WATT
LED = LIGHT EMITTING DIODE
* = LIGHT INSTALLED BY CITY OF NEWARK



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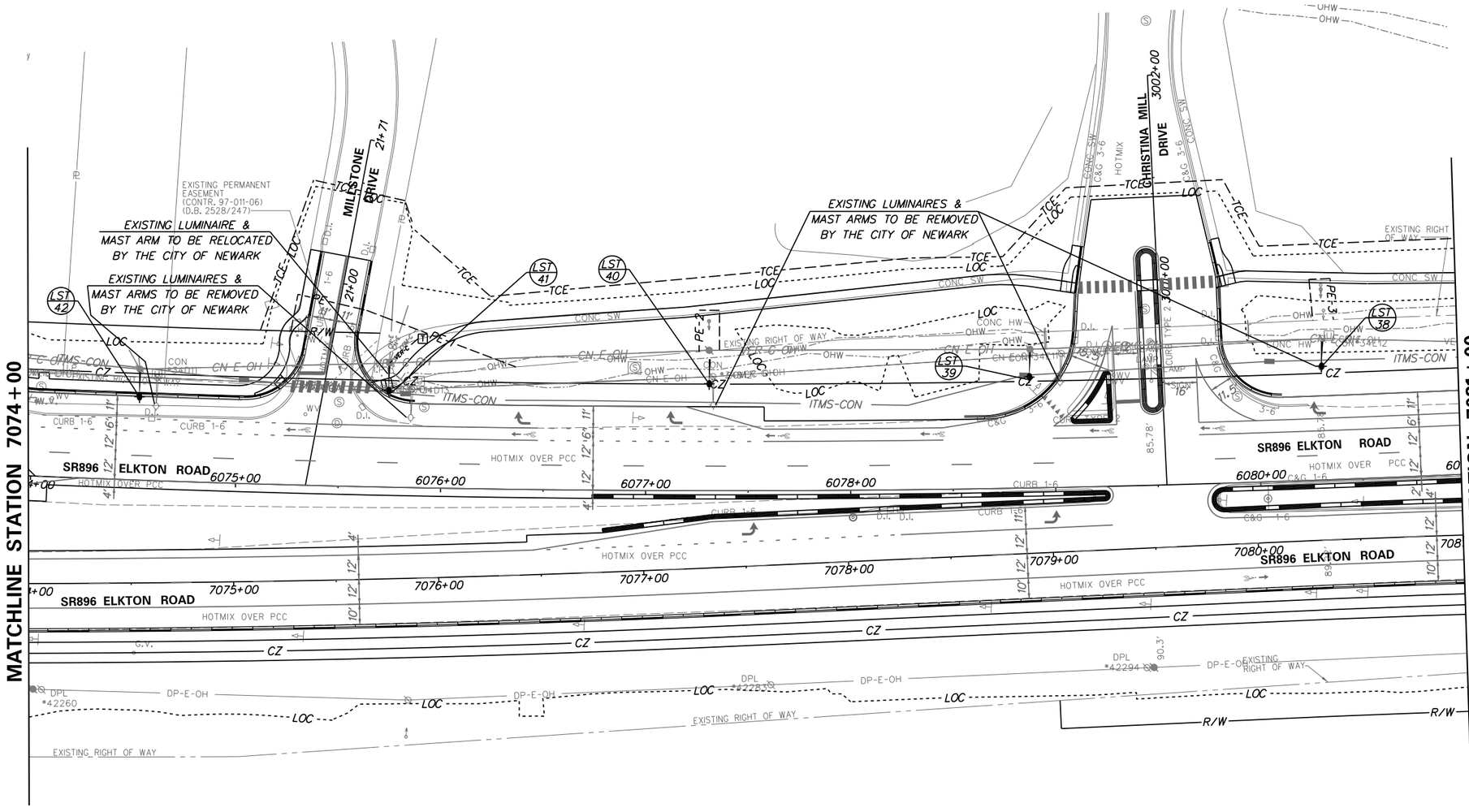
FILE LOCATION: Q:\NDE\140659_007_ELKTON_RD_CASHO_MILL\CADD\LI.DGN [SHEET: LI09]

DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401 / COUNTY NEW CASTLE	BRIDGE NO. 1-322 1-322P 1-323 1-323P / DESIGNED BY: GYB / CHECKED BY: MAW	LIGHTING PLAN	LI-09 / SHEET NO. 329 / TOTAL SHTS. 431

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	STATION	OFFSET	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE
*38	N/A	6080+33	57' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*39	N/A	6078+89	58' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*40	N/A	6077+32	59' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*41	N/A	6075+75	56' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*42	N/A	6074+52	52' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT

W = WATT
LED = LIGHT EMITTING DIODE
* = LIGHT TO BE INSTALLED BY CITY OF NEWARK



PLOTTED BY: LBERZINA DATE: 8/25/2017
FILE LOCATION: Q:\NDE\140659_007_ELKTON_RD_CASHO_MILL\CADD\LI.DGN [SHEET: LI10]

DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401 / COUNTY NEW CASTLE	BRIDGE NO. 1-322 1-322P 1-323 1-323P / DESIGNED BY: GYB / CHECKED BY: MAW

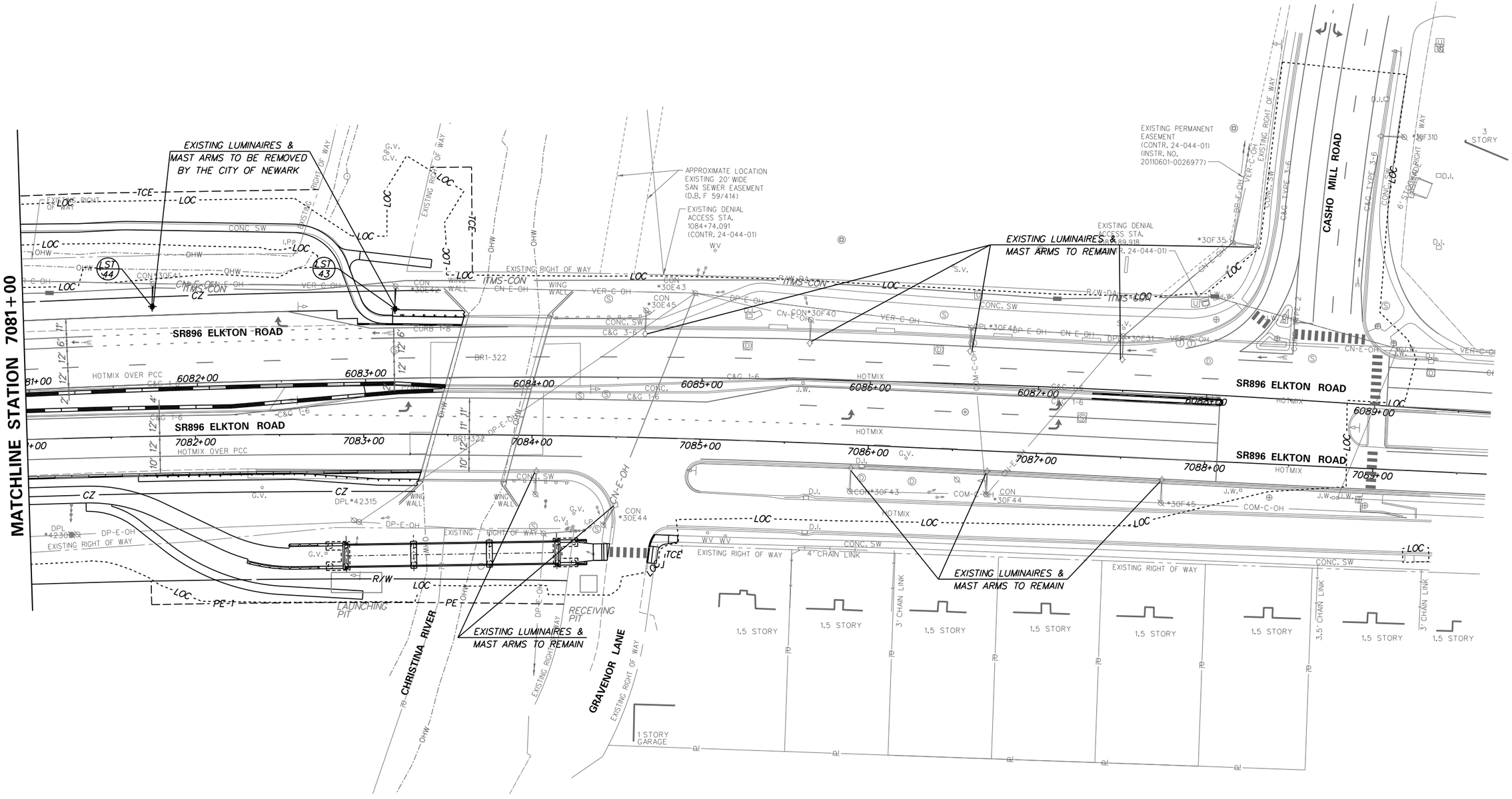
LIGHTING PLAN

LI-10
SHEET NO. 330
TOTAL SHTS. 431

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	STATION	OFFSET	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE
*43	N/A	6083+18	43' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT
*44	N/A	6081+75	48' LT	12'	UTILITY POLE	N/A	LED LUMINAIRE - 250W HPS EQUIVALENT

W = WATT
LED = LIGHT EMITTING DIODE
* = LIGHT TO BE INSTALLED BY CITY OF NEWARK



PLOTTED BY: LBERZINA DATE: 8/25/2017
FILE LOCATION: Q:\NDE\140659_007_ELKTON_RD_CASHO_MILL\CADD\LI.DGN [SHEET: LI11]

DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE
0 30 60 90
FEET

ELKTON ROAD
MD LINE TO
CASHO MILL ROAD

CONTRACT	BRIDGE NO.	1-322 1-322P 1-323 1-323P
T201504401	DESIGNED BY: GYB	
COUNTY	CHECKED BY: MAW	
NEW CASTLE		

LIGHTING PLAN

LI-11
SHEET NO. 331
TOTAL SHTS. 431

LIGHTING STANDARD SCHEDULE

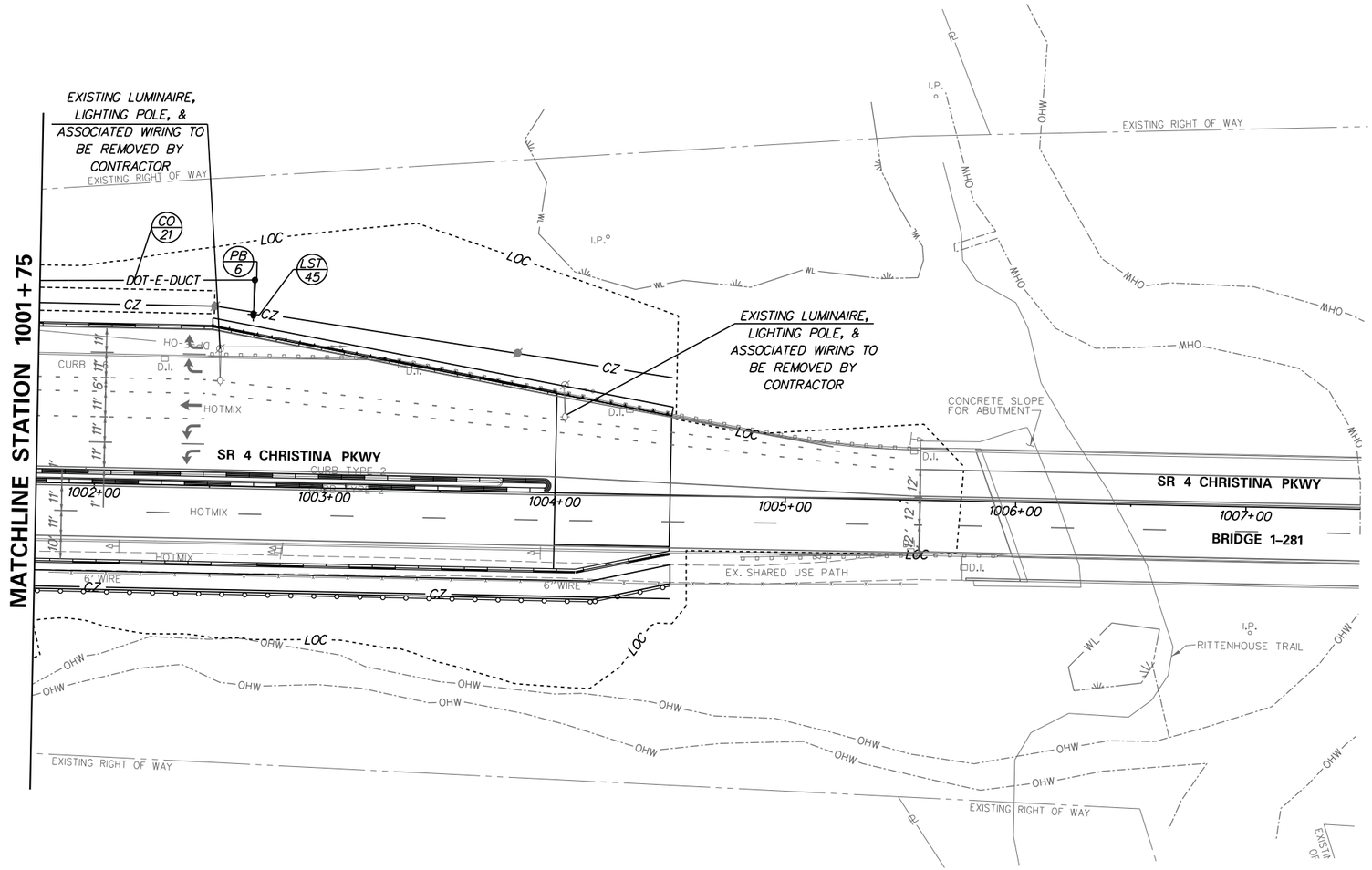
NO.	CIRCUIT NO.	STATION	OFFSET	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE
45	2A1	1002+68	88' LT	15'	30' ALUMINUM LIGHT POLE	TYPE 6	LED LUMINAIRE - 250W HPS EQUIVALENT

W = WATT
LED = LIGHT EMITTING DIODE

LIGHTING SERVICE SCHEDULE

SERVICE RUN NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-21	INFORMATION PROVIDED ON SHEET LI-09				

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
B = BORE, T = TRENCH, O = OPEN CUT



DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE
0 30 60 90
FEET

ELKTON ROAD
MD LINE TO
CASHO MILL ROAD

CONTRACT	BRIDGE NO.	1-322 1-322P 1-323 1-323P
T201504401	DESIGNED BY: GYB	
COUNTY	CHECKED BY: MAW	
NEW CASTLE		

LIGHTING PLAN

LI-12
SHEET NO. 332
TOTAL SHTS. 431

GENERAL NOTES

1. ALL ELECTRICAL WORK SHALL BE PERFORMED AND ALL MATERIAL PROVIDED SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE OF THE NATIONAL FIRE PROTECTION ASSOCIATION, TO ALL LOCAL AND SPECIAL LAWS, AND/OR TO ORDINANCES GOVERNING SUCH MATERIAL. CODE SHALL BE CONSIDERED THE MINIMUM REQUIREMENTS FOR THE ELECTRICAL WORK AND IF THERE IS A CONFLICT BETWEEN THE REQUIREMENTS SPECIFIED IN THE CONTRACT DOCUMENTS AND THE CODE, THE MORE STRINGENT REQUIREMENT WILL APPLY AS DETERMINED AND APPROVED BY THE ENGINEER. WHEN THESE REQUIREMENTS DO NOT GOVERN, AND WHERE NOT OTHERWISE SPECIFIED, ELECTRICAL MATERIALS SHALL CONFORM TO THE STANDARDIZATION RULES OF THE INSTITUTE OF ELECTRICAL ENGINEERS.

2. CONDUIT RUNS ARE SHOWN IN APPROXIMATE LOCATIONS. THE CONTRACTOR SHALL LOCATE THE CONDUIT RUNS IN A MANNER THAT AVOIDS CONFLICTS WITH ALL EXISTING AND PROPOSED FEATURES AS APPROVED BY THE ENGINEER.

3. THE CONTRACTOR SHALL PROVIDE AND SECURE ALL ELECTRICAL INSPECTIONS AS REQUIRED AND PAY FOR THE SAME.

4. THE ELECTRICAL CONTRACTOR SHALL GUARANTEE ALL WORK MATERIAL AND LABOR TO BE FREE FROM DEFECTS FOR A ONE YEAR PERIOD FROM THE TIME OF OWNER ACCEPTANCE. ANY DEFECTS OCCURING DURING THIS PERIOD SHALL BE CORRECTED BY THE ELECTRICAL CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.

5. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AT SITE PRIOR TO WORK.

6. WORK INCLUDES FURNISHING LABOR, MATERIAL, EQUIPMENT AND SERVICE NECESSARY AND INCIDENTAL TO PROPER COMPLETION OF THE ELECTRICAL WORK AS SHOWN. MINOR ITEMS, ACCESSORIES OR DEVICES NECESSARY FOR COMPLETION AND PROPER OPERATION OF ANY SYSTEM SHALL BE PROVIDED WHETHER OR NOT THEY ARE SPECIFICALLY CALLED FOR BY SPECIFICATIONS OR DRAWINGS.

7. THE ELECTRICAL CONTRACTOR SHALL COORDINATE HIS WORK WITH ALL THE CONTRACTORS INVOLVED ON THIS PROJECT. THE ELECTRICAL CONTRACTOR SHALL COORDINATE WITH THE ENGINEER AND THE GENERAL SUPERINTENDENT FOR THE LOCATIONS OF ALL CONDUITS AND POLE BASES TO ELIMINATE CONSTRUCTION CONFLICTS.

8. THE ELECTRICAL CONTRACTOR SHALL OBTAIN, AT HIS EXPENSE, ALL NECESSARY PERMITS AND CERTIFICATES AS REQUIRED.

9. TERMINATE ALL CONDUITS WHEN ENTERING ENCLOSURES WITH LOCKNUT AND BONDING BUSHINGS. ALL OTHER CONDUITS SHALL BE PROVIDED WITH BONDING BUSHINGS. ALL CONDUITS SHALL BE BONDED WITH THE GROUND WIRE.

10. COLOR CODING SHALL BE PROVIDED THROUGHOUT THE ENTIRE NETWORK FOR SERVICE, FEEDER, BRANCH AND CONTROL CONDUCTORS. EACH PHASE SHALL BE AN INDEPENDENT COLOR. CONDUCTORS SHALL HAVE FACTORY IMPREGNATED COLOR THROUGHOUT THEIR ENTIRE LENGTH. PHASE TAPING IS NOT PERMITTED.

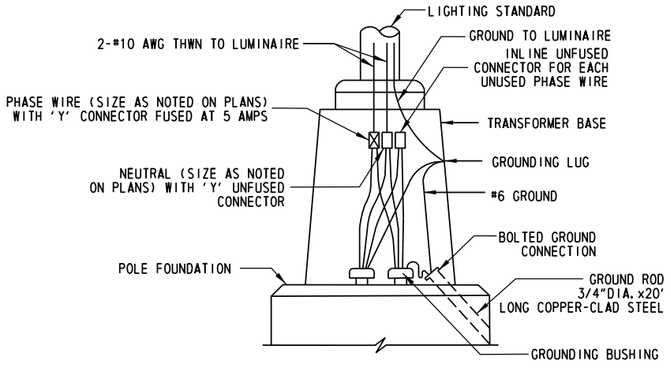
11. THE CONTRACTOR SHALL NOTIFY DELMARVA POWER TWO WEEKS IN ADVANCE TO ARRANGE FINAL POWER CONNECTIONS. CONTACT: MR. ANGEL M. COLLAZO 302-454-4370. THE CONTACT INFORMATION, AS NEEDED, FOR THE DIRECTOR OF THE CITY OF NEWARK ELECTRICAL DEPARTMENT IS: MR. RICK VITELLI, 302-366-7000 (X2083).

12. ALL FUSED CONNECTIONS SHALL BE MADE IN THE POLE BASE, UNLESS OTHERWISE NOTED. SPLICES IN JUNCTION BOXES OR PULL BOXES SHALL NOT BE FUSED EXCEPT AT NEMA 4X BOXES, IF NEEDED.

13. USE CAUTION WHEN INSTALLING CONDUITS UNDER EXISTING CULVERTS. WHEN COMPLETE, ENSURE ALL STORM WATER MANAGEMENT FACILITIES ARE RESTORED TO EXISTING CONDITIONS.

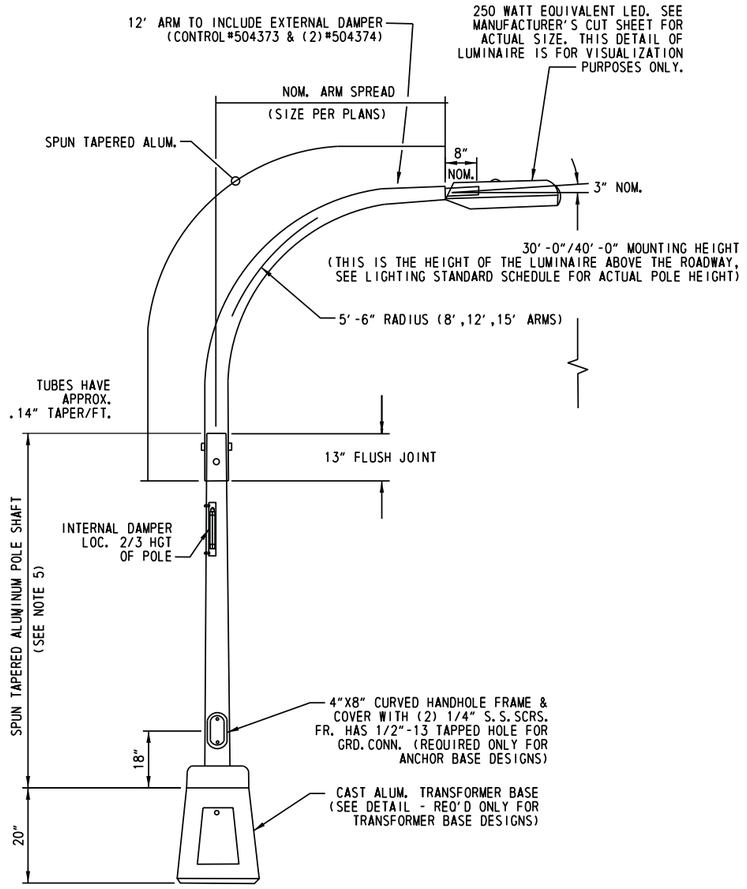
14. ALL COSTS ASSOCIATED WITH CONNECTING PROPOSED CONDUIT TO EXISTING JUNCTION WELLS OR EXISTING CONDUITS SHALL BE CONSIDERED INCIDENTAL TO THE COST OF THE CONDUIT BEING INSTALLED.

15. ALL COSTS ASSOCIATED WITH WELDING GROUNDING WIRE TO SHEET PILE WALLS SHALL BE CONSIDERED INCIDENTAL TO THE COST OF INSTALLING THE CABLE.



TYPICAL LUMINAIRE CONNECTION
120/240V SERVICE

N.T.S.

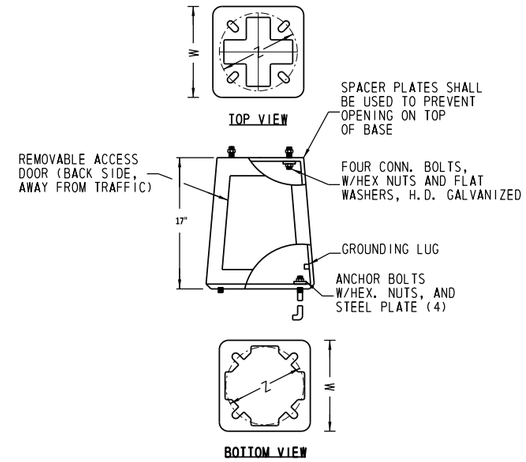


DAVIT ARM LIGHT POLE DETAIL

N.T.S.

NOTES:
1. HEAT TREAT POLE & DAVIT TO -T6, TEMPER AFTER WELDING.
2. FINISH - POLE & DAVIT SHALL BE SATIN FINISHED POLISHED AND WRAPPED.
3. DESIGNED IN ACCORDANCE WITH STANDARDS ESTABLISHED BY THE LATEST EDITION OF AASHTO REQUIREMENTS.
4. TRANSFORMER SHALL MEET THE STANDARDS ESTABLISHED BY THE LATEST EDITION OF AASHTO BREAKAWAY REQUIREMENTS.
5. DUE TO VARYING ELEVATIONS OF ROADWAY, IT MAY BE NECESSARY TO MAINTAIN A NOMINAL FIXTURE MOUNTING HEIGHT (OF 30' OR 40', AS SPECIFIED ON PLANS) ABOVE THE ROADWAY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THESE MEASUREMENTS. BETWEEN TWO ADJACENT LUMINAIRES, THE DIFFERENCE IN HEIGHT SHALL NOT EXCEED 12".

MATERIAL SPECIFICATION	
POLE & DAVIT TUBES	6063-T6
ANCHOR BASE	AA356-T6
BOLT COVERS	AA356
ANCHOR BOLT NUTS	ASTM-A563 GR. A
ANCHOR BOLTS	ASTM-F1554 GR55
STN. STL. HARDWARE	AISI-300 SERIES STN. STL.
TRANSFORMER BASE	AA356-T6
T-BASE HARDWARE	ASTM-A325 GALV.



LIGHTING STRUCTURE ON BREAKAWAY TRANSFORMER BASE

N.T.S.

MOUNTING HEIGHT	ARM LENGTH	MIN WIDTH 'W'	BOLT DIA.	BOLT CIRCLE 'Z'
LESS THAN 40'	LESS THAN 30'	13"	1"	13 ½"

NOTES:
1. ALUMINUM TRANSFORMER BASE SHALL MEET 1985 AASHTO BREAKAWAY REQUIREMENTS

2. BREAKAWAY TRANSFORMER BASES SHALL BE INSTALLED WITH ALL POLES, UNLESS OTHERWISE NOTED.

3. OPENING OF TRANSFORMER BASE ACCESS DOOR SHALL BE INSTALLED ON THE SIDE OF THE POLE FACING AWAY FROM TRAFFIC.

4. PROVIDE ACCESSIBLE GROUNDING NUT OR LUG INSIDE TRANSFORMER BASE.

5. PROVIDE WASHERS, SHIMS AND BOLTS AS REQUIRED BY TRANSFORMER BASE MANUFACTURER.

6. THE CONTACT AREA BETWEEN THE TRANSFORMER BASE AND CONCRETE FOUNDATION SHALL BE SHOP COATED WITH COAL TAR EPOXY MEETING SSPC-PAINT 16 SPECIFICATIONS. THE THICKNESS OF THE COATING SHALL BE BETWEEN 6 AND 8 MILS. THE COATING SHALL BE COMPLETELY DRY BEFORE INSTALLATION. THE TOP OF THE FOUNDATION SHALL NOT BE PAINTED.

7. TOP AND BOTTOM OF BASE MAY BE SLOTTED FOR BOLT CIRCLE. SLOT MUST ACCOMMODATE DIMENSION SHOWN.

8. TRANSFORMER BASE AND ASSOCIATED COMPONENTS SHALL MEET THE FOLLOWING MATERIAL REQUIREMENTS:

MATERIAL SPECIFICATION	
POLE & DAVIT TUBES	6063-T6
ANCHOR BASE	AA356-T6
BOLT COVERS	AA356
ANCHOR BOLT NUTS	ASTM-A563 GR. A
ANCHOR BOLTS	ASTM-F1554 GR55
STN. STL. HARDWARE	AISI-300 SERIES SST
TRANSFORMER BASE	AA356-T6
T-BASE HARDWARE	ASTM-A325 GALV.

DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE
0 30 60 90
FEET

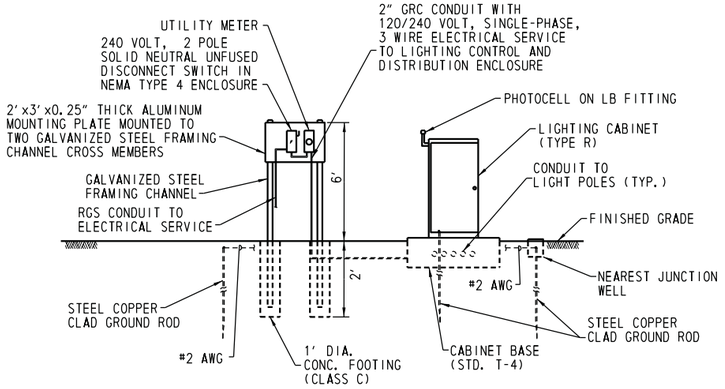
ELKTON ROAD
MD LINE TO
CASHO MILL ROAD

CONTRACT	BRIDGE NO.	1-322 1-322P 1-323 1-323P
T201504401	DESIGNED BY: GYB	
COUNTY		
NEW CASTLE	CHECKED BY: MAW	

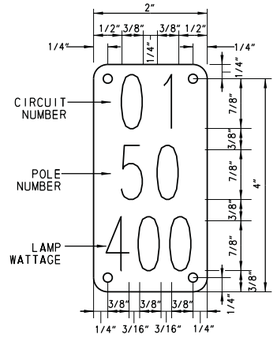
LIGHTING PLAN

LI-13

SHEET NO.	TOTAL SHTS.
333	431



ELECTRICAL UTILITY SERVICE EQUIPMENT
AND LIGHTING CONTROL
AND DISTRIBUTION ENCLOSURE DETAIL



TYPICAL POLE
IDENTIFICATION TAG

NOTES:

1. IDENTIFICATION TAG SHALL BE INSTALLED ON THE SIDE OF THE POLE FACING AWAY FROM TRAFFIC.

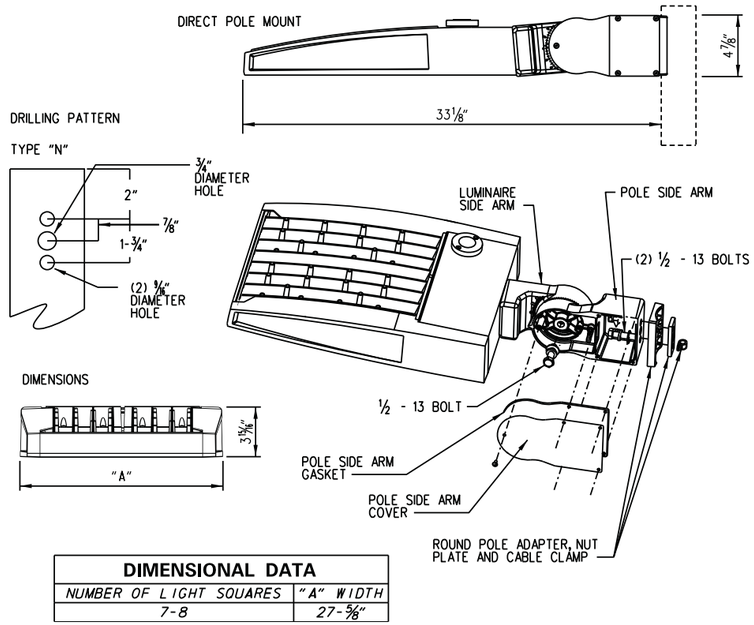
2. POLE ARMS SHALL BE ALIGNED PERPENDICULAR TO THE EDGE OF TRAVELEDWAY, UNLESS OTHERWISE DIRECTED.

3. THE OUTER SLEEVE MEMBER AT THE LIGHT STANDARD FLUSH JOINT SHALL BE FURNISHED WITH PREDRILLED THROUGH HOLES AT 90 DEGREES APART (MIN. 6" DISTANCE BETWEEN HOLES). THE INNER MEMBER SHALL BE DRILLED IN THE FIELD AFTER THE POLE SHAFT IS INSTALLED AND THE DAVIT ARM IS ALIGNED.

4. LAMP TYPE, WATTAGE AND HORIZONTAL DISTRIBUTION TYPE SHALL BE AS SPECIFIED ON THE PLANS. ALL LUMINAIRES SHALL BE MOUNTED AT A ZERO DEGREE TILT ANGLE. PHOTOCELL AS REQUIRED PER PLANS.

5. LUMINAIRES SHALL HAVE CUTOFF OPTICS, AND BE LABELLED WITH AN IDENTIFICATION STICKER IN ACCORDANCE WITH NEMA CONVENTIONS.

COBRAHEAD LUMINAIRE DETAIL
N. T. S.



DIMENSIONAL DATA	
NUMBER OF LIGHT SQUARES	*"A" WIDTH*
7-8	27-5/8"

LED LUMINAIRE - SPECIAL FIXTURE DETAIL
N. T. S.

DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS	

SCALE
0 30 60 90
FEET

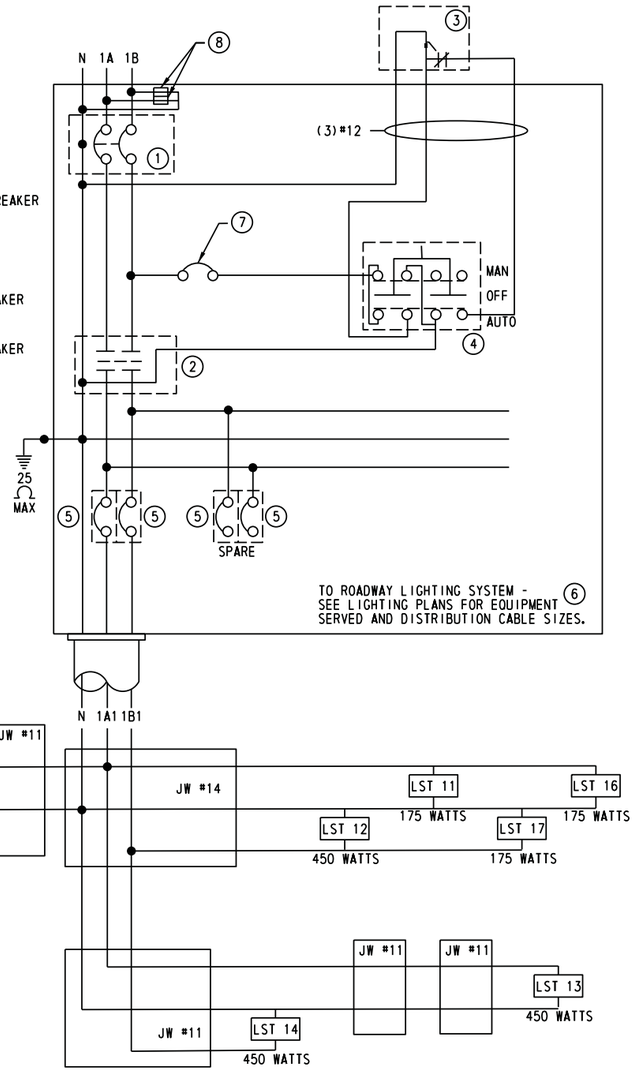
ELKTON ROAD
MD LINE TO
CASHO MILL ROAD

CONTRACT	BRIDGE NO.	1-322 1-322P 1-323 1-323P
T201504401	DESIGNED BY: GYB	
COUNTY	CHECKED BY: MAW	
NEW CASTLE		

LIGHTING PLAN

LI-14
SHEET NO. 334
TOTAL SHTS. 431

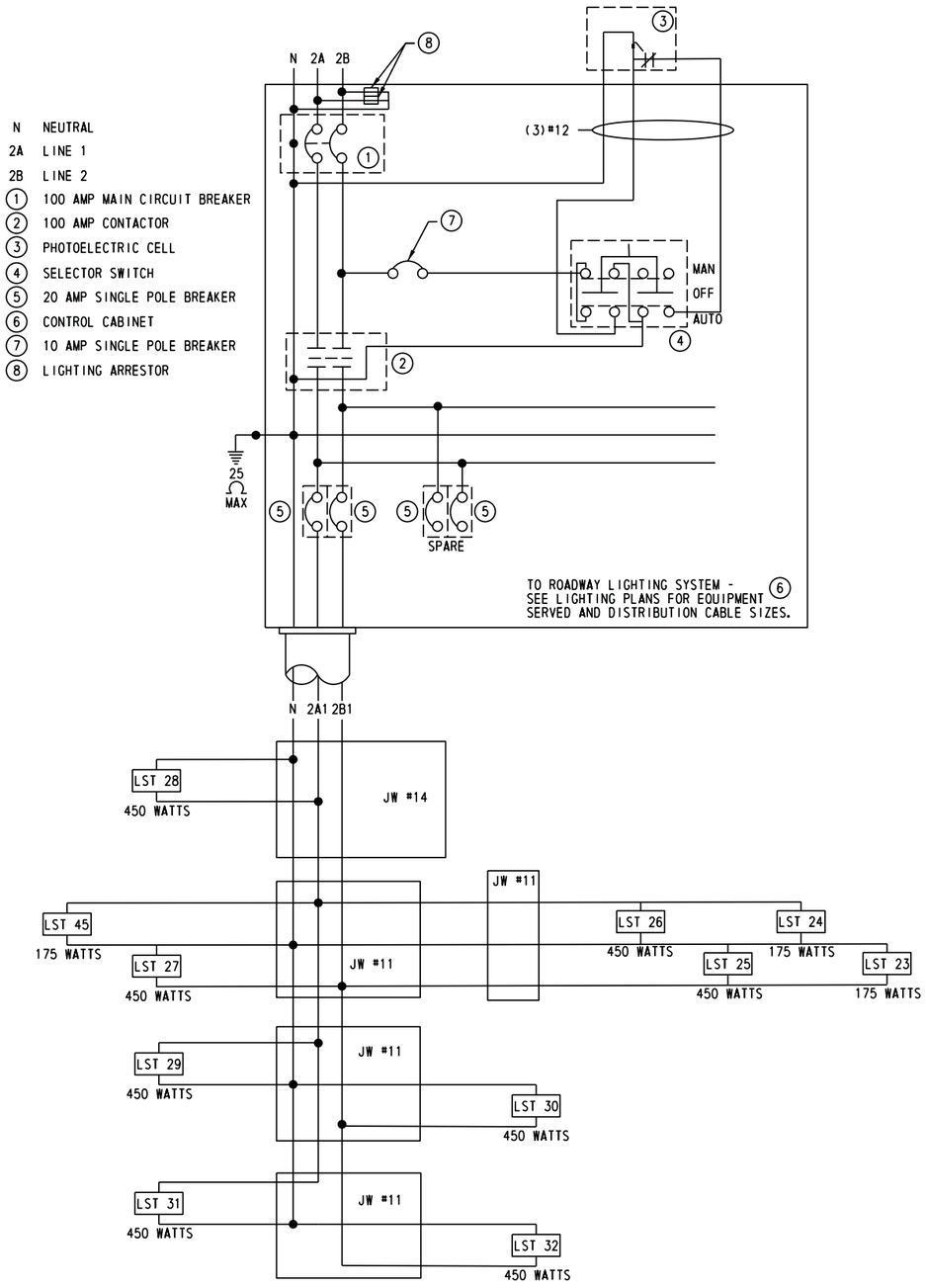
N NEUTRAL
1A LINE 1
1B LINE 2
(1) 100 AMP MAIN CIRCUIT BREAKER
(2) 100 AMP CONTACTOR
(3) PHOTOELECTRIC CELL
(4) SELECTOR SWITCH
(5) 20 AMP SINGLE POLE BREAKER
(6) CONTROL CABINET
(7) 10 AMP SINGLE POLE BREAKER
(8) LIGHTING ARRESTOR



PROPOSED LOAD CENTER CABINET
(LOCATED AT OTTS CHAPEL ROAD INTERSECTION)
SCHEMATIC WIRING DIAGRAM POWERING
LIGHTS #11-#14, & #16-#18

N. T. S.

N NEUTRAL
2A LINE 1
2B LINE 2
(1) 100 AMP MAIN CIRCUIT BREAKER
(2) 100 AMP CONTACTOR
(3) PHOTOELECTRIC CELL
(4) SELECTOR SWITCH
(5) 20 AMP SINGLE POLE BREAKER
(6) CONTROL CABINET
(7) 10 AMP SINGLE POLE BREAKER
(8) LIGHTING ARRESTOR



PROPOSED LOAD CENTER CABINET
(LOCATED AT SR 4-CHRISTIANA PARKWAY INTERSECTION)
SCHEMATIC WIRING DIAGRAM POWERING
LIGHTS #23-#32, & #45

N. T. S.

PLOTTED BY: LBERZINA DATE: 8/25/2017
FILE LOCATION: Q:\NDE\140659_007_ELKTON_RD_CASHO_MILL\CADD\LI.DGN [SHEET: LI15]

DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS	

NOT TO SCALE

ELKTON ROAD
MD LINE TO
CASHO MILL ROAD

CONTRACT	BRIDGE NO.	1-322 1-322P 1-323 1-323P
T201504401	DESIGNED BY: GYB	
COUNTY		
NEW CASTLE	CHECKED BY: MAW	

LIGHTING PLAN

LI-15	
SHEET NO.	335
TOTAL SHTS.	431

APPENDIX K.
LIGHTING DESIGN REPORT

DelDOT Lighting Design Report

169 Brick Store Landing Road, Smyrna, DE

General Project Information

Date: _____

Contract Number: _____

Project Name: _____

Description of Project Limits: _____

Description of Project Improvements: _____

County: _____

Designer: _____

Reviewer: _____

Existing Lighting

Existing Lighting Present? ☐

If YES, Existing As-Built Plans Located? ☐

If YES:

☐ Existing As-Builts Included with Submission

If NO:

☐ Overview of Existing Lighting Layout Included with Submission

Description of Existing Lighting Equipment:

☐ Utility-Owned/Tariff Lighting (preferred): _____

_____

- Name of Utility: _____

☐ DelDOT-Owned Lighting: _____

_____

☐ Municipality-Owned Lighting: _____

_____

- Name of Municipality: _____

☐ Private Lighting: _____

_____

- Name of Private Entity: _____

DelDOT Lighting Design Report

169 Brick Store Landing Road, Smyrna, DE

Design Values: Roadways

Roadway #1 (Name): _____
Functional Classification:_____
General Land Use Classification: _____
Minimum Average Maintained Illuminance (foot-candles): _____
Minimum Illuminance (foot-candles): _____
Maximum Illuminance Uniformity Ratio (Avg/Min): _____

Roadway #2 (Name): _____
Functional Classification:_____
General Land Use Classification: _____
Minimum Average Maintained Illuminance (foot-candles): _____
Minimum Illuminance (foot-candles): _____
Maximum Illuminance Uniformity Ratio (Avg/Min): _____

Roadway #3 (Name): _____
Functional Classification:_____
General Land Use Classification: _____
Minimum Average Maintained Illuminance (foot-candles): _____
Minimum Illuminance (foot-candles): _____
Maximum Illuminance Uniformity Ratio (Avg/Min): _____

Design Values: Intersections

Intersection #1:
Intersection Type (Circle One): [ ]
Minimum Average Maintained Illuminance (foot-candles): _____
Minimum Illuminance (foot-candles): _____
Maximum Illuminance Uniformity Ratio (Avg/Min): _____

Intersection #2:
Intersection Type (Circle One): [ ]
Minimum Average Maintained Illuminance (foot-candles): _____
Minimum Illuminance (foot-candles): _____
Maximum Illuminance Uniformity Ratio (Avg/Min): _____

Intersection #3:
Intersection Type (Circle One): [ ]
Minimum Average Maintained Illuminance (foot-candles): _____
Minimum Illuminance (foot-candles): _____
Maximum Illuminance Uniformity Ratio (Avg/Min): _____

DelDOT Lighting Design Report

169 Brick Store Landing Road, Smyrna, DE

Proposed Lighting Equipment

☐ Utility-Owned/Tariff Lighting (preferred) [If YES, attach utility statement]: _____

_____

- Name of Utility: _____

☐ DelDOT-Owned Lighting: _____

_____

☐ Municipality-Owned Lighting [If YES, attach signed agreement]:_____

_____

- Name of Municipality: _____

☐ Private Lighting: _____

_____

- Name of Private Entity: _____

Proposed Design Summary

Does Proposed Lighting Meet Design Requirements? ☐

If NO, What Prevented the Design from Meeting the Requirements? _____

_____

_____

_____

Luminaire Summary

(Information could also be provided via analysis summary from calculation software)

Luminaire #1:

Location Description: _____
Pole Type: _____
Mounting Height: _____
Arm Length: _____
Vendor:_____
Luminaire Type: _____
Wattage: _____
Lumen Output: _____
Vertical Light Distribution: _____
Lateral Light Distribution: _____
Color Temperature: _____
Light Control: _____
Drive Current: _____

Luminaire #2:

Location Description: _____
Pole Type: _____
Mounting Height: _____
Arm Length: _____
Vendor:_____
Luminaire Type: _____
Wattage: _____
Lumen Output: _____
Vertical Light Distribution: _____
Lateral Light Distribution: _____
Color Temperature: _____
Light Control: _____
Drive Current: _____

Luminaire #3:

Location Description: _____
Pole Type: _____
Mounting Height: _____
Arm Length: _____
Vendor:_____
Luminaire Type: _____
Wattage: _____
Lumen Output: _____
Vertical Light Distribution: _____
Lateral Light Distribution: _____
Color Temperature: _____
Light Control: _____
Drive Current: _____

Luminaire #4:

Location Description: _____
Pole Type: _____
Mounting Height: _____
Arm Length: _____
Vendor:_____
Luminaire Type: _____
Wattage: _____
Lumen Output: _____
Vertical Light Distribution: _____
Lateral Light Distribution: _____
Color Temperature: _____
Light Control: _____
Drive Current: _____

DelDOT Lighting Design Report

169 Brick Store Landing Road, Smyrna, DE

Power Source Summary

Power Source #1:
Proposed Lighting Cabinet? ☐
Proposed Service Disconnect? ☐ Secondary Service Disconnect? ☐
Equipment Location Description: _____
Power Source Location: _____
Utility Supplying Power: _____
Level of Power (circle one): ☐

Power Source #2:
Proposed Lighting Cabinet? ☐
Proposed Service Disconnect? ☐ Secondary Service Disconnect? ☐
Equipment Location Description: _____
Power Source Location: _____
Utility Supplying Power: _____
Level of Power (circle one): ☐

Power Source #3:
Proposed Lighting Cabinet? ☐
Proposed Service Disconnect? ☐ Secondary Service Disconnect? ☐
Equipment Location Description: _____
Power Source Location: _____
Utility Supplying Power: _____
Level of Power (circle one): ☐

Additional Information: _____

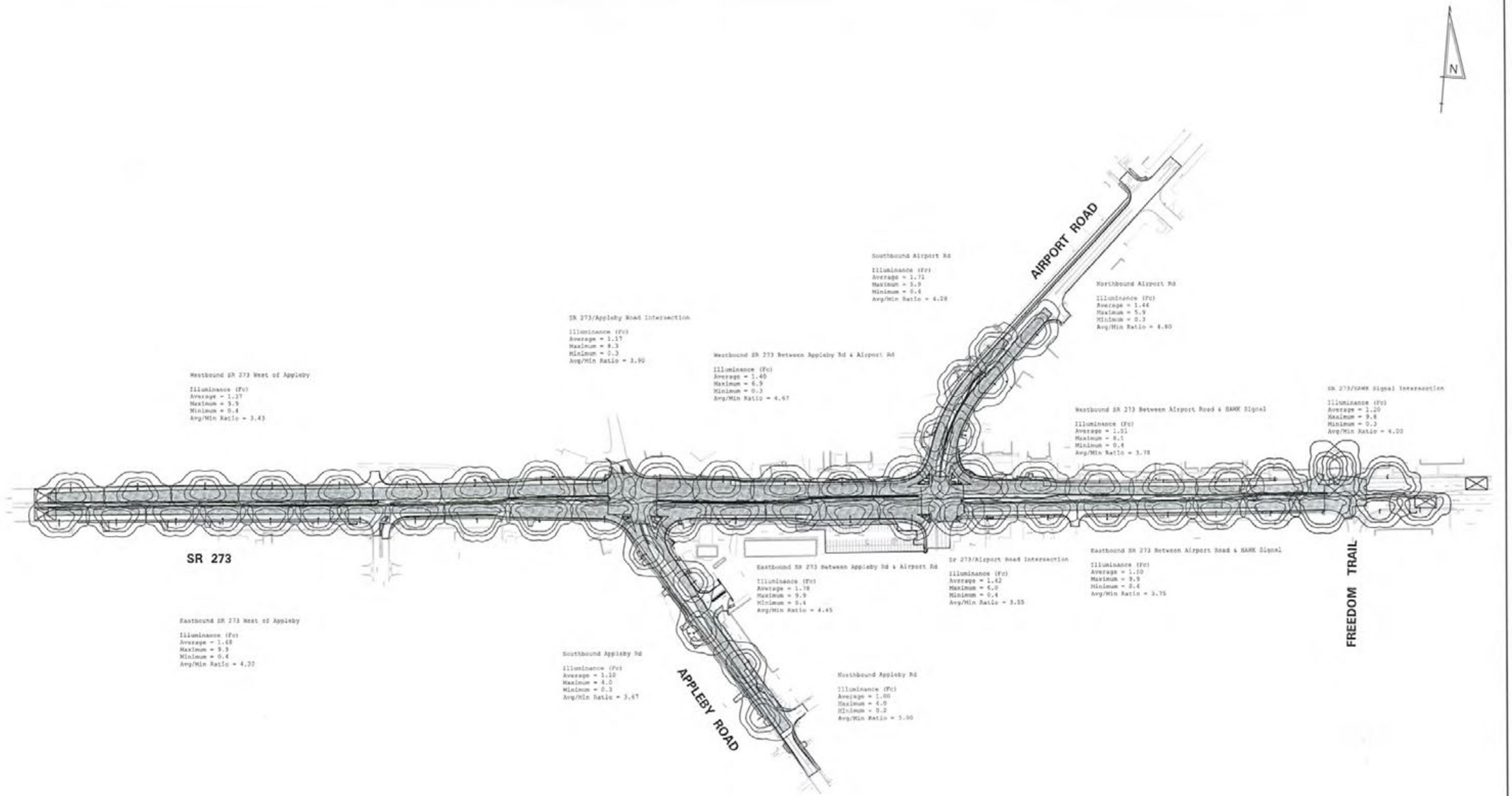
Included with Submission:

- ☐ As-Built Plan / Existing Lighting Layout
- ☐ Warranting Form A
- ☐ Photometric Plan
- ☐ Photometric Analysis Results
- ☐ IES Files and Spec Sheets
- ☐ Additional Supporting Documents

Approved By: _____ **Date:** _____
(DelDOT)

Approved By: _____ **Date:** _____
(DelDOT Chief Traffic Engineer or Designee)

APPENDIX L.
SAMPLE LIGHTING DESIGN REPORT FIGURE



PLOTTED BY: GYOUNG DATE: 1/2/2017
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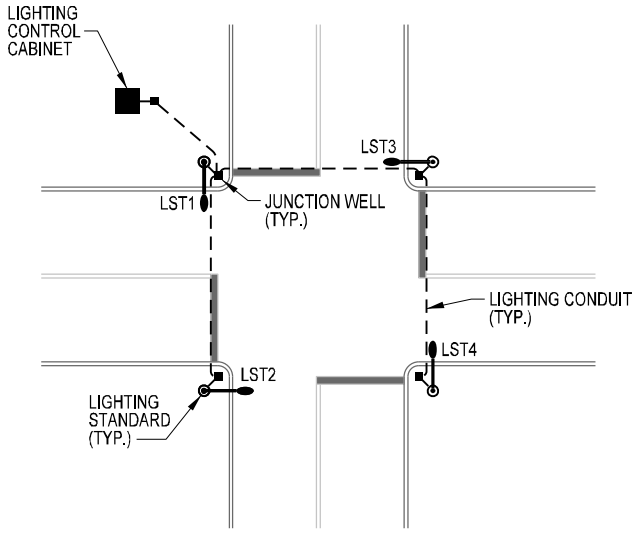
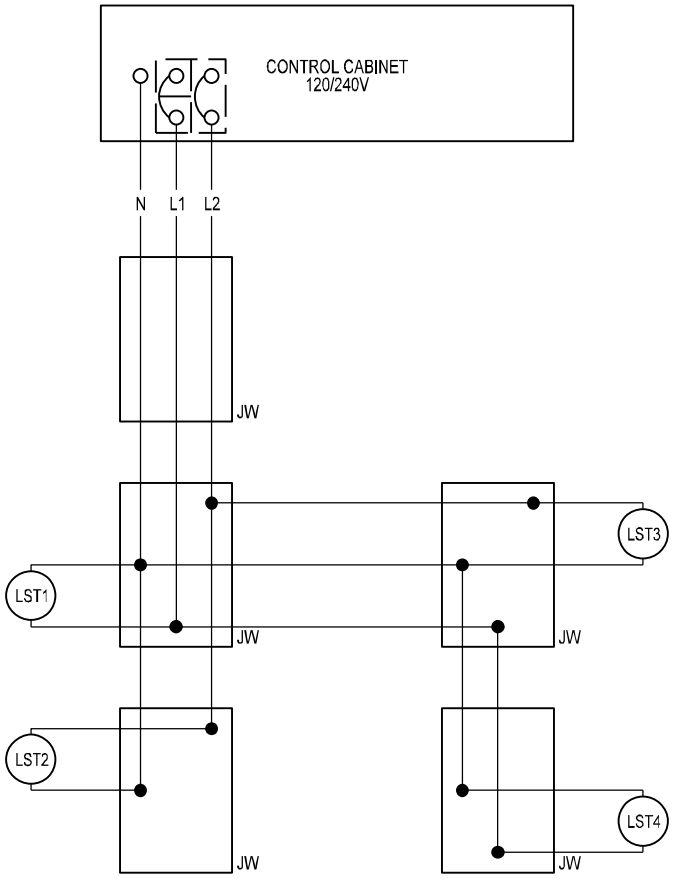
DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	NOT TO SCALE	SR273, APPLEBY ROAD TO AIRPORT ROAD	CONTRACT: T200900704	BRIDGE NO.: N/A	LIGHTING PLAN	SHEET NO.: 1
				COUNTY: NEW CASTLE	DESIGNED BY: GYB		TOTAL SHTS.: 1
					CHECKED BY: MAW		

APPENDIX M.
LIGHTING WIRING DIAGRAM SAMPLES:

1. SMALLER 120/240V SYSTEM



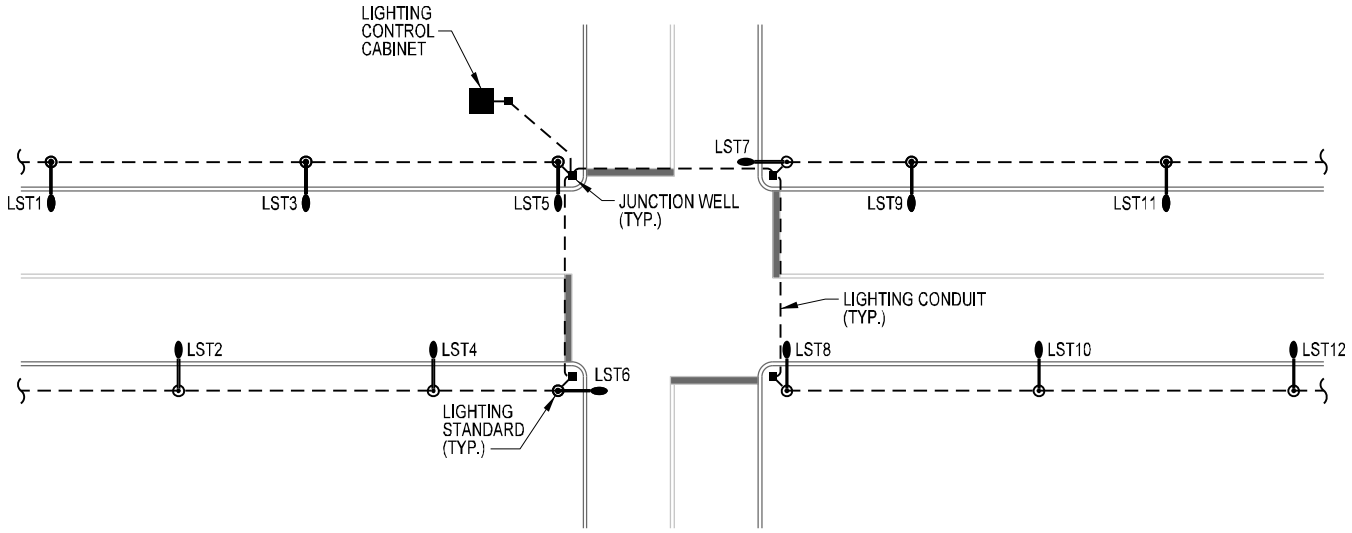
PLAN



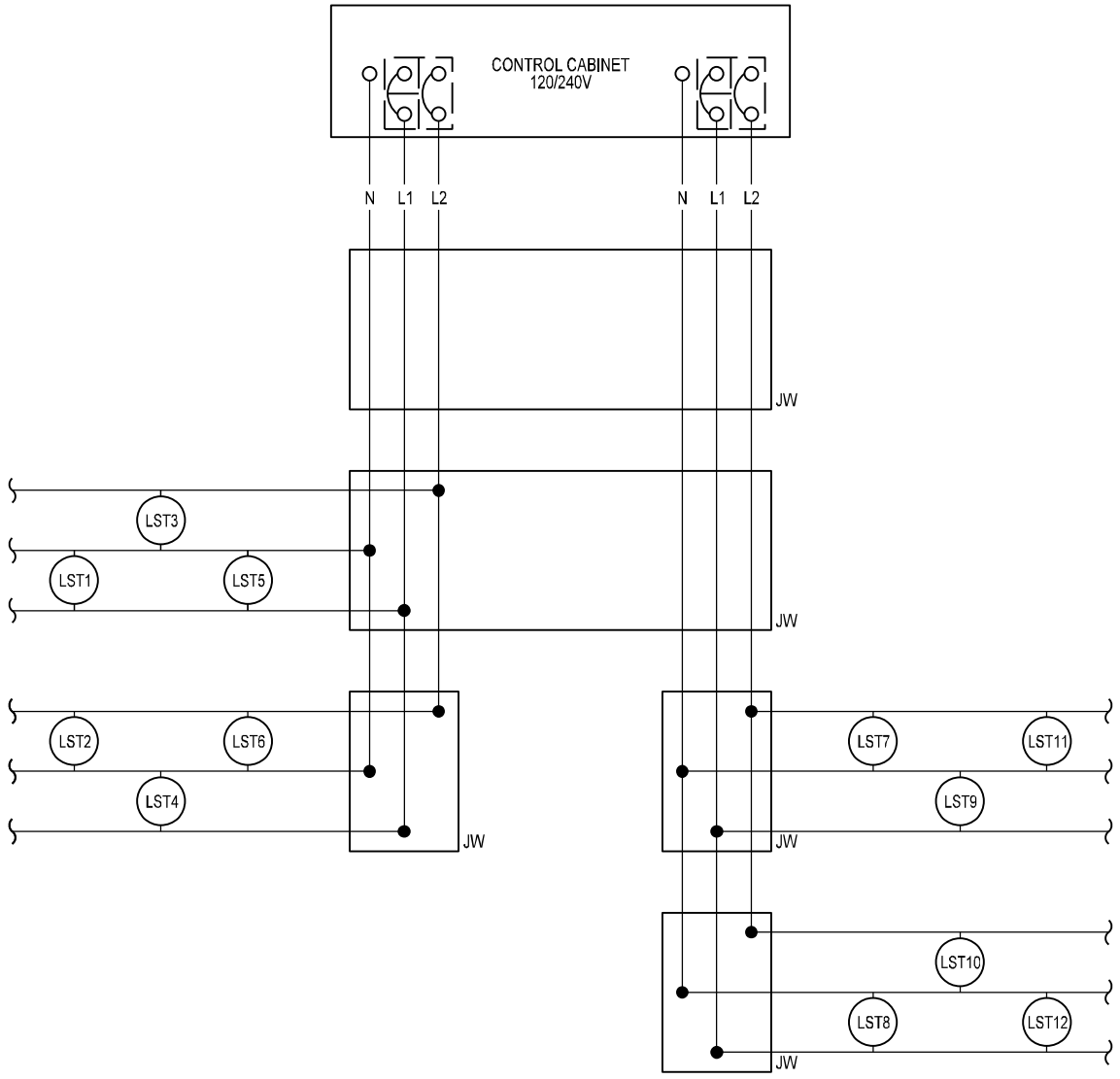
CIRCUITING DIAGRAM

SAMPLE: SMALL INTERSECTION CIRCUITING DIAGRAM - 120/240V

APPENDIX M.
LIGHTING WIRING DIAGRAM SAMPLES:
2. LARGER 120/240V SYSTEM



PLAN



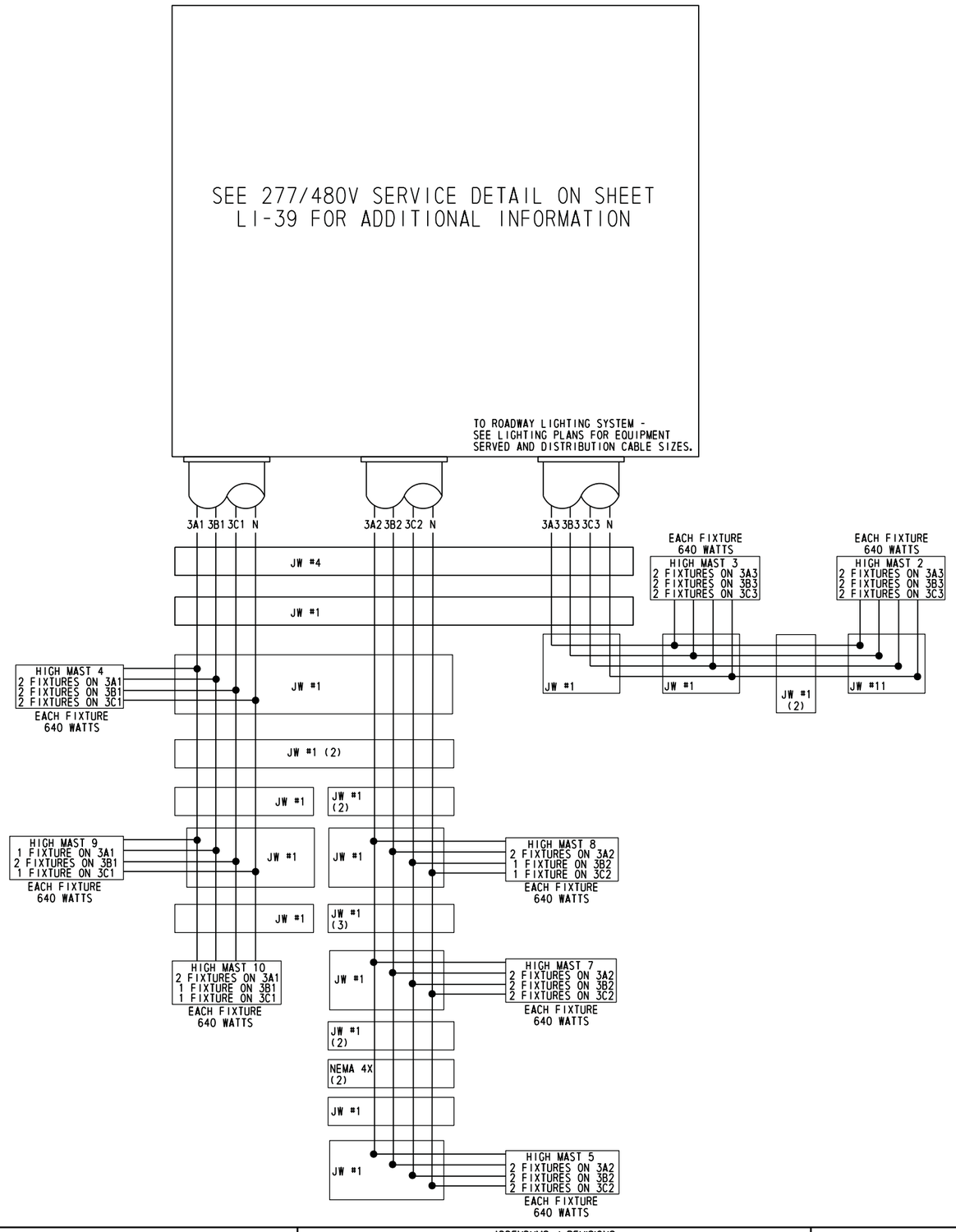
CIRCUITING DIAGRAM

SAMPLE: LARGE INTERSECTION CIRCUITING DIAGRAM - 120/240V

APPENDIX M.
LIGHTING WIRING DIAGRAM SAMPLES:
3. 277/480V SYSTEM

PROPOSED LOAD CENTER CABINET
SCHEMATIC WIRING DIAGRAM
POWERING LIGHTS: #HM2-#HM5, & #HM7-#HM10
(POWER SOURCE #3 - STA. 1205+59, OFFSET 133'LT)

N.T.S.



DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	NOT TO SCALE	SR 141 IMPROVEMENTS, I-95 INTERCHANGE TO JAY DRIVE	CONTRACT T201109001	BRIDGE NO. 676/677	LIGHTING PLAN	LI-37
				COUNTY NEW CASTLE	DESIGNED BY: GYB		SHEET NO. 765
					CHECKED BY: MAW		TOTAL SHTS. 904

APPENDIX M.
LIGHTING WIRING DIAGRAM SAMPLES:
4. PANEL SCHEDULE

PANELBOARD - POWER SOURCE #3

277/480V
3 PHASE, 4 WIRE + GND
200 AMP M.C.B.

600 AMP BUS
LUMINAIRE VOLTAGE: 277 VOLTS

CKT. NO.	EQUIPMENT SERVED	CONNECTED LOAD		PHASE AND VOLTS	BRANCH CIRCUIT BREAKERS			REMARKS	CKT. NO.	EQUIPMENT SERVED	CONNECTED LOAD		PHASE AND VOLTS	BRANCH CIRCUIT BREAKERS			REMARKS
		KW	AMPS		NUMBER OF POLES	FRAME SIZE	TRIP SIZE				KW	AMPS		NUMBER OF POLES	FRAME SIZE	TRIP SIZE	
1 (3A1)	HM-10 (2), HM-4 (2), HM-9 (1)	3.22	11.6	3/277	3	100	20A	5-640 WATT LED	2 (3A2)	HM-5 (2), HM-7 (2), HM-8 (2)	3.85	13.9	3/277	3	100	20A	6-640 WATT LED
3 (3B1)	HM-10 (1), HM-4 (2), HM-9 (2)	3.22	11.6	3/277				5-640 WATT LED	4 (3B2)	HM-5 (2), HM-7 (2), HM-8 (1)	3.22	11.6	3/277				5-640 WATT LED
5 (3C1)	HM-10 (1), HM-4 (2), HM-9 (1)	2.58	9.3	3/277				4-640 WATT LED	6 (3C2)	HM-5 (2), HM-7 (2), HM-8 (1)	3.22	11.6	3/277				5-640 WATT LED
7 (3A3)	HM-2 (2), HM-3 (2)	2.58	9.3	3/277	3	100	20A	4-640 WATT LED	8	SPARE							
9 (3B3)	HM-2 (2), HM-3 (2)	2.58	9.3	3/277				4-640 WATT LED	10	SPARE							
11 (3C3)	HM-2 (2), HM-3 (2)	2.58	9.3	3/277				4-640 WATT LED	12	SPARE							
13	SPARE								14	SPARE							
15	SPARE								16	SPARE							
17	SPARE								18	SPARE							
19	SPARE								20	SPARE							
21	SPARE								22	SPARE							
23	SPARE								24	SPARE							

NOTE: PANELBOARD SHALL HAVE A MINIMUM SIZE OF 24 SPACES TO ACCOMODATE FUTURE USE.

PANELBOARD - POWER SOURCE #4

277/480V
3 PHASE, 4 WIRE + GND
200 AMP M.C.B.

600 AMP BUS
LUMINAIRE VOLTAGE: 277 VOLTS

CKT. NO.	EQUIPMENT SERVED	CONNECTED LOAD		PHASE AND VOLTS	BRANCH CIRCUIT BREAKERS			REMARKS	CKT. NO.	EQUIPMENT SERVED	CONNECTED LOAD		PHASE AND VOLTS	BRANCH CIRCUIT BREAKERS			REMARKS
		KW	AMPS		NUMBER OF POLES	FRAME SIZE	TRIP SIZE				KW	AMPS		NUMBER OF POLES	FRAME SIZE	TRIP SIZE	
1 (4A1)	LST: 38, 41, 42, 45, 46, 51, 56, 58, 60	2.52	9.1	3/277	3	100	20A	9-400W HPS EQUIVALENT LED	2 (4A2)	HM-1 (2), HM-6 (2), HM-14 (2), LST 33	2.58	9.3	3/277	3	100	20A	6-640 WATT LED 1-400W HPS EQUIVALENT LED
3 (4B1)	LST: 36, 39, 43, 47, 52, 54, 57, 59	2.28	8.2	3/277				8-400W HPS EQUIVALENT LED	4 (4B2)	HM-1 (2), HM-6 (2), HM-14 (2), LST 34	2.58	9.3	3/277				6-640 WATT LED 1-400W HPS EQUIVALENT LED
5 (4C1)	LST: 37, 40, 44, 48, 49, 50, 53, 55	2.28	8.2	3/277				8-400W HPS EQUIVALENT LED	6 (4C2)	HM-1 (2), HM-6 (2), HM-14 (2), LST 35	2.58	9.3	3/277				6-640 WATT LED 1-400W HPS EQUIVALENT LED
7 (4A3)	HM-11 (2), HM-12 (2), HM-13 (2)	3.85	13.9	3/277	3	100	20A	6-640 WATT LED	8 (4A4)	LST: E1, E4, E7 HM-14 (2)	2.27	8.2	3/277	3	100	20A	2-640 WATT LED 3-400W HPS EQUIVALENT LED
9 (4B3)	HM-11 (1), HM-12 (2), HM-13 (2)	3.22	11.6	3/277				6-640 WATT LED	10 (4B4)	LST: E3, E6 HM-14 (2)	1.94	7.0	3/277				2-640 WATT LED 2-400W HPS EQUIVALENT LED
11 (4C3)	HM-11 (1), HM-12 (2), HM-13 (2)	3.22	11.6	3/277				6-640 WATT LED	12 (4C4)	LST: E2, E5 HM-14 (2)	1.94	7.0	3/277				2-640 WATT LED 2-400W HPS EQUIVALENT LED
13	SPARE								14	SPARE							
15	SPARE								16	SPARE							
17	SPARE								18	SPARE							
19	SPARE								20	SPARE							
21	SPARE								22	SPARE							
23	SPARE								24	SPARE							

NOTE: PANELBOARD SHALL HAVE A MINIMUM SIZE OF 24 SPACES TO ACCOMODATE FUTURE USE.

PLOTTED BY: GABEL DATE: 12/8/2017
FILE LOCATION: Q:\NDE\060272_019_I-95_AND_SR_141_INTE\CADD\LI.DGN [SHEET: LI43]

DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

NOT TO SCALE

SR 141 IMPROVEMENTS, I-95
INTERCHANGE TO JAY DRIVE

CONTRACT T201109001
COUNTY NEW CASTLE
BRIDGE NO. 676/677
DESIGNED BY: GYB
CHECKED BY: MAW

LIGHTING PLAN

LI-43
SHEET NO. 771
TOTAL SHTS. 904

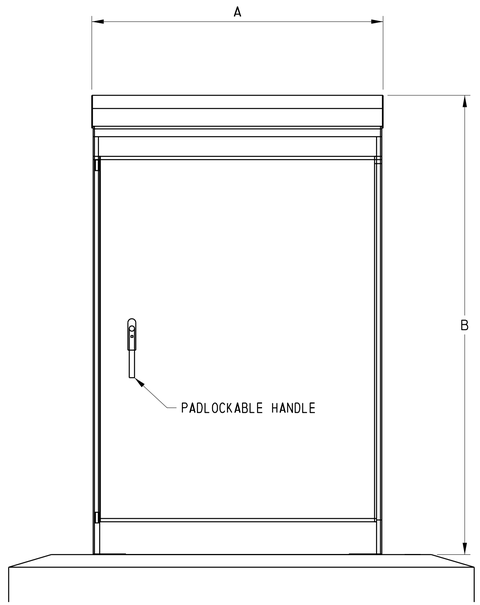
APPENDIX N.
LIGHTING DETAILS

SCALE : NTS

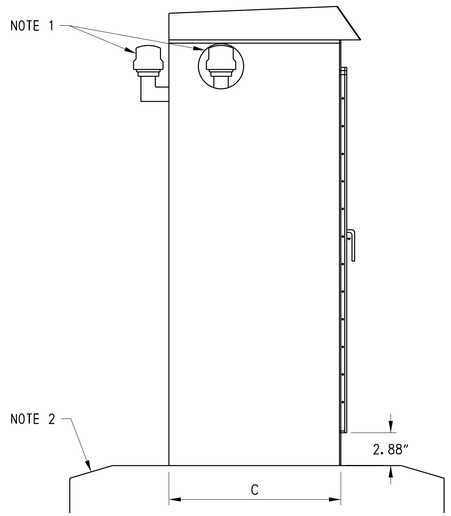
CABINET TYPE		
DIM.	TYPE R	TYPE M
A	44"	30"
B	77"	51"
C	25.5"	16.88"

CONSTRUCTION NOTES:

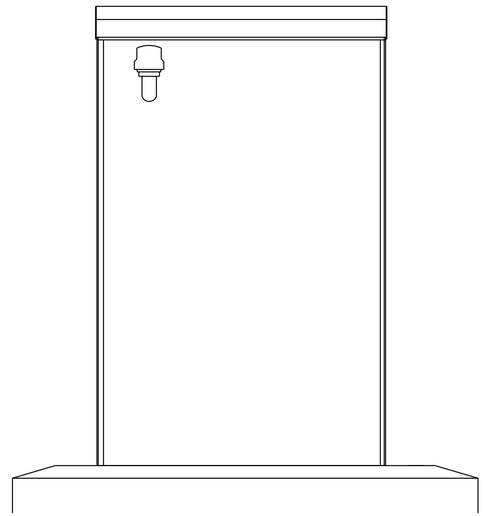
1. PHOTOCELL SHALL BE MOUNTED ON BACK OR SIDE OF CABINET ON 90 DEGREE CONDUIT FITTING TO AVOID VEHICLE HEADLIGHT GLARE. PHOTOCELLS CAN ALSO BE INSTALLED INSIDE OF THE CABINET, BEHIND A PLEXI-GLASS SHIELD.
2. REFER TO STANDARD DETAILS T-4-1 (2013) AND T-4-2 (2017) FOR CABINET BASE DETAILS.
3. CABINET SHALL BE NEMA 4X AND SHALL BE FABRICATED FROM 0.125 5052-H32 ALUMINUM.
4. METER AND LOAD-SIDE DISCONNECT SWITCH TO BE MOUNTED SEPARATELY FROM CABINET. REFER TO STANDARD DETAIL T-17 METERED SERVICE PEDESTAL.



FRONT VIEW



SIDE VIEW



BACK VIEW

DELAWARE
DEPARTMENT OF TRANSPORTATION

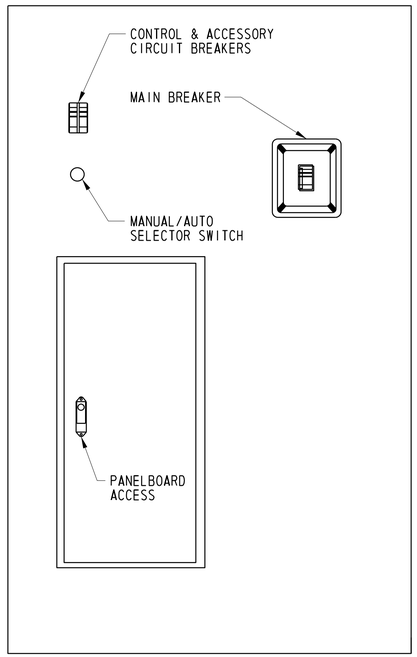
LIGHTING CONTROL CABINET DETAIL

STANDARD NO. T-#(2011) | SHT. 1 OF 1

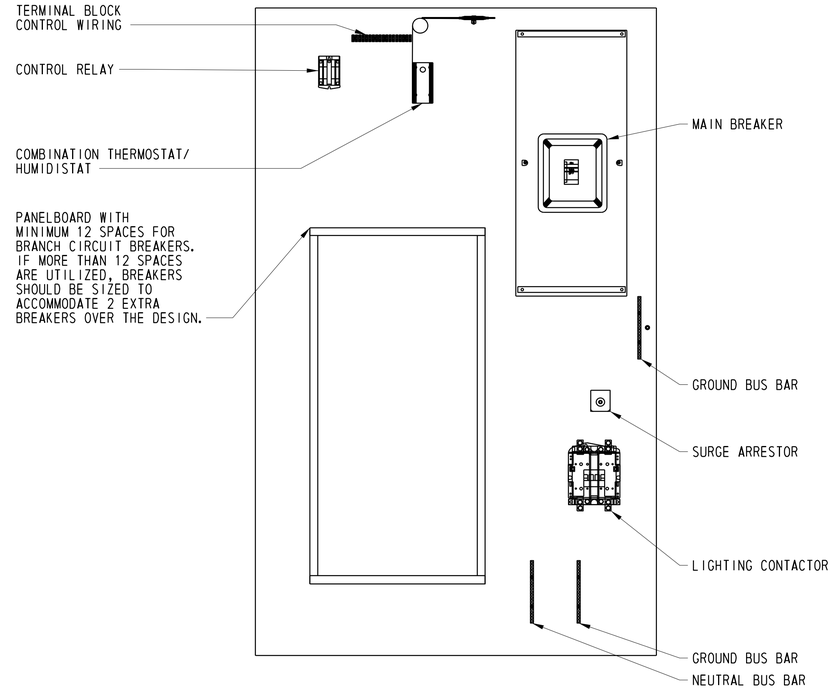
APPROVED SIGNATURE ON FILE CHIEF ENGINEER // DATE

RECOMMENDED SIGNATURE ON FILE DESIGN ENGINEER // DATE

SCALE : NTS



DEAD FRONT PANEL LAYOUT



BACK PANEL LAYOUT

NOTES:

1. THREE PHASE LIGHTING CABINET COMPONENTS SHALL BE RATED AS FOLLOWS:

   CONTROL & ACCESSORY CIRCUIT BREAKERS - 15 AMP, 277 VAC
   MAIN BREAKER - 200 A, 600 V, 3PH, 3-POLE
   CONTROL RELAY - 480 VAC
   SURGE ARRESTOR - 3PH, 4W, 480Y/277 VAC
   LIGHTING CONTACTOR - 200 A, 600 V, 3-POLE
   PANELBOARD - 480Y/277V, 3PH, 4W, 200 A
   PHOTOCELL - 277 VAC
   THERMOSTAT/HUMIDISTAT - 277 VAC
   FAN - 277V VAC

2. SINGLE PHASE LIGHTING CABINET COMPONENTS SHALL BE RATED AS FOLLOWS:

   CONTROL & ACCESSORY CIRCUIT BREAKERS - 15 AMP, 120 VAC
   MAIN BREAKER - 100 A, 120 VAC, 1PH, 2-POLE
   CONTROL RELAY - 120 VAC
   SURGE ARRESTOR - 1PH, 3W, 120/240 VAC
   LIGHTING CONTACTOR - 100 A, 120 VAC, 2-POLE
   PANELBOARD - 120/240 VAC, 1PH, 3W, 100 A
   PHOTOCELL - 120 VAC
   THERMOSTAT/HUMIDISTAT - 120 VAC
   FAN - 120 VAC

3. BRANCH CIRCUIT BREAKERS SHALL BE BOLT-IN COMMERCIAL GRADE CAPABLE OF ACCEPTING UP TO A #2 AWG CONDUCTOR WIRE. TERMINAL BLOCKS SHALL BE INSTALLED IF CONDUCTOR WIRES ARE LARGER THAN #2 AWG.

LIGHTING CABINET LAYOUT

NOT TO SCALE

DELAWARE
DEPARTMENT OF TRANSPORTATION

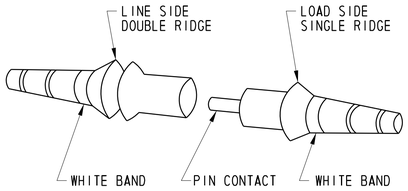
LIGHTING CABINET LAYOUT

STANDARD NO. T-#(2011) | SHT. 1 OF 1

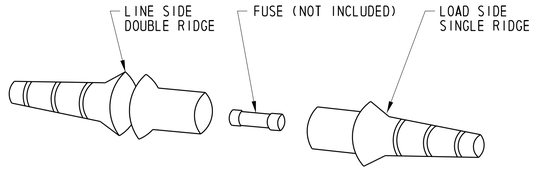
APPROVED SIGNATURE ON FILE — CHIEF ENGINEER — DATE / /

RECOMMENDED SIGNATURE ON FILE — DESIGN ENGINEER — DATE / /

SCALE : NTS



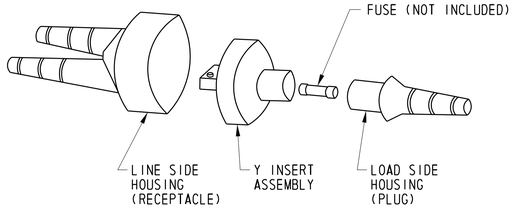
TYPE I - INLINE NON-FUSED



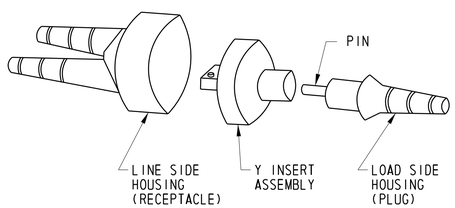
TYPE II - INLINE FUSED

NOTES:

1. QUICK DISCONNECT CONNECTOR KITS SHALL HAVE BUILT-IN BREAKAWAY DESIGN TO ELIMINATE DE-ENERGIZATION OF COMPLETE CIRCUITS AND EXPOSED WIRES IN THE EVENT OF A KNOCKDOWN.
2. CONNECTOR KITS SHALL BE USED IN THE TRANSFORMER BASE OF LIGHTING STRUCTURES TO SPLICE BRANCH CIRCUIT CONDUCTORS WITH THE LUMINAIRE CONDUCTORS.
3. IF NECESSARY, TYPE IV KITS MAY BE USED IN JUNCTION WELLS TO Y-SPLICE BRANCH CIRCUIT CONDUCTORS WHEN LIGHTING CIRCUIT DESIGN DICTATES A NEED FOR SUCH A SPLICE.
4. NEUTRAL WIRES SHALL NOT BE FUSED AND SHALL ONLY BE SPLICED USING TYPE I AND TYPE IV CONNECTOR KITS .
5. FUSES SHALL BE ORDERED SEPARATELY AND WILL BE INCIDENTAL TO CONNECTOR KITS. FUSES SHALL BE SIZED ACCORDING TO SPECIFIED LIGHTING FIXTURES.
6. REFER TO SPECIFICATION FOR CONNECTOR KIT DETAILS.



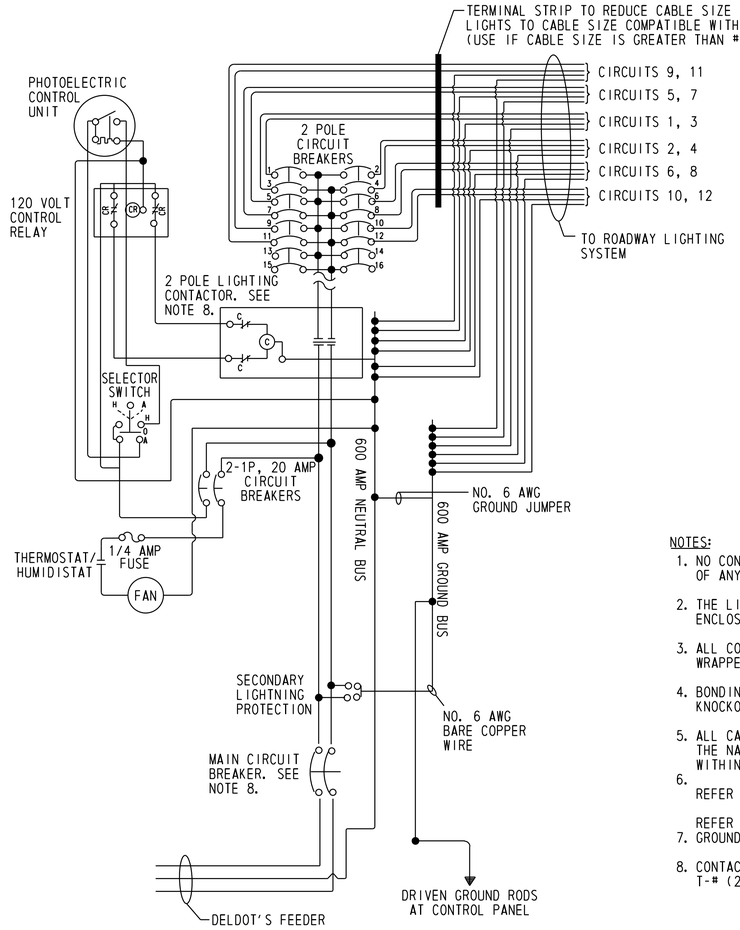
TYPE III - Y-FUSED



TYPE IV - NON-FUSED

DELAWARE DEPARTMENT OF TRANSPORTATION	CONNECTOR KITS TYPE I, II, III AND IV			APPROVED	SIGNATURE ON FILE CHIEF ENGINEER — / / DATE
	STANDARD NO. T-#(2011)	SHT. 1 OF 1		RECOMMENDED	SIGNATURE ON FILE DESIGN ENGINEER — / / DATE

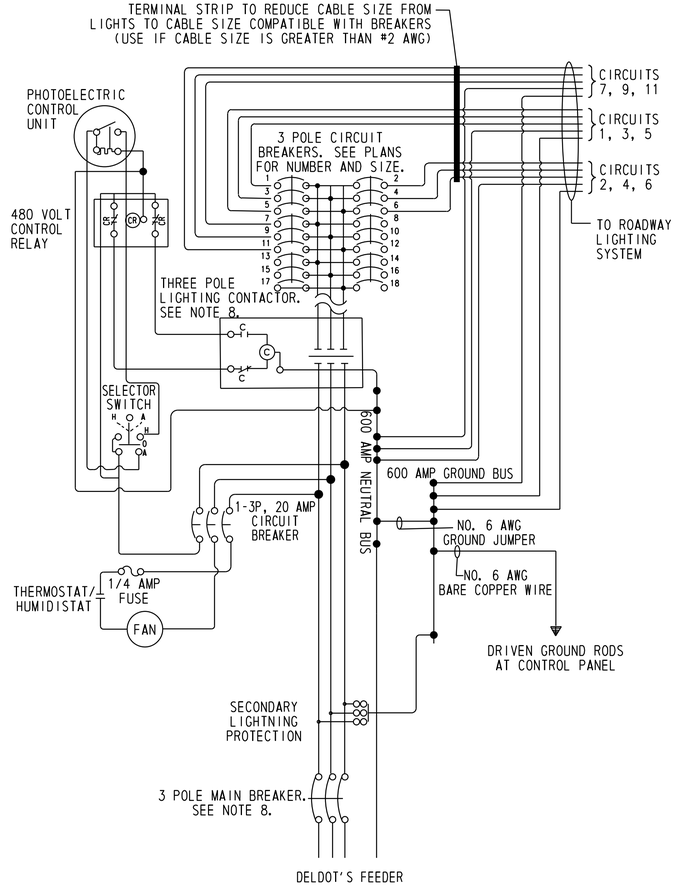
SCALE : NTS



120/240 VOLT
LIGHTING CONTROL CENTER
WIRING DIAGRAM

NOTES:

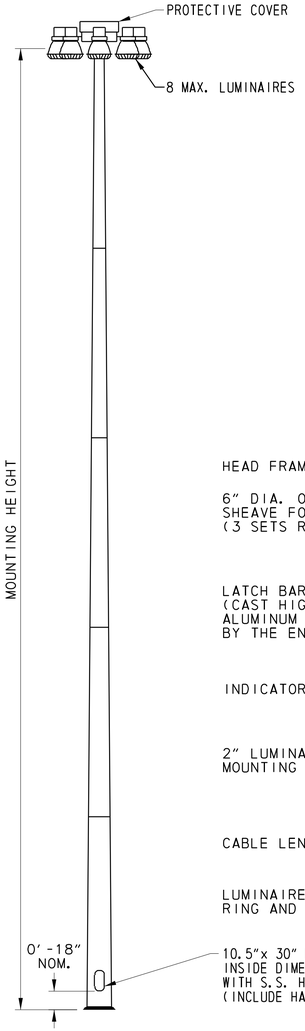
1. NO CONDUCTORS MAY ENTER OR EXIT THROUGH THE REAR OF ANY PANEL.
2. THE LIGHTING CONTACTOR SHALL BE IN A PROPERLY SIZED ENCLOSURE.
3. ALL CONDUCTORS NOT IN CONDUIT SHALL BE BUNDLED OR WRAPPED AND SECURED IN CABINET AWAY FROM SHARP EDGES.
4. BONDING BUSHINGS SHALL BE USED FOR ALL CONCENTRIC KNOCKOUTS.
5. ALL CABLES SHALL MEET AMPACITY REQUIREMENTS OF THE NATIONAL ELECTRIC CODE. THE MINIMUM CABLE SIZE WITHIN THE CONTROL CENTER SHALL BE NO. 12 AWG.
6. REFER TO PLANS FOR NUMBER AND SIZE OF CIRCUIT BREAKERS.
7. REFER TO PLANS FOR NUMBER AND SIZE OF ELECTRODE GROUNDING CONDUCTOR WIRES REQUIRED.
8. CONTACTOR AND MAIN BREAKER TO BE SIZED PER STD T-# (2011) - LIGHTING CABINET LAYOUT.



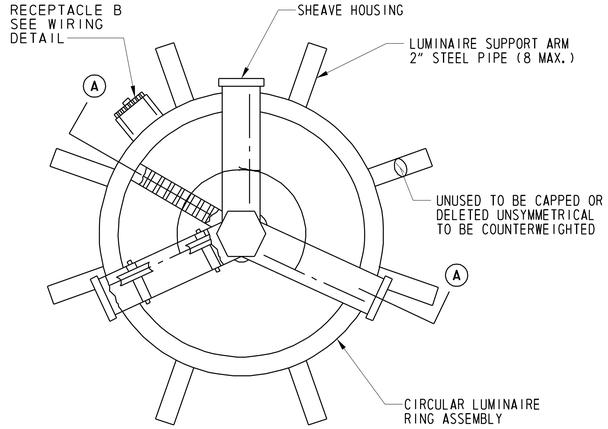
277/480 VOLT
LIGHTING CONTROL CENTER
WIRING DIAGRAM

DELAWARE DEPARTMENT OF TRANSPORTATION	LIGHTING CONTROL CABINET WIRING DIAGRAMS			APPROVED	SIGNATURE ON FILE (CHIEF ENGINEER)	/ / (DATE)
	STANDARD NO. T-#(2011)	SHT. 1 OF 1		RECOMMENDED	SIGNATURE ON FILE (DESIGN ENGINEER)	/ / (DATE)

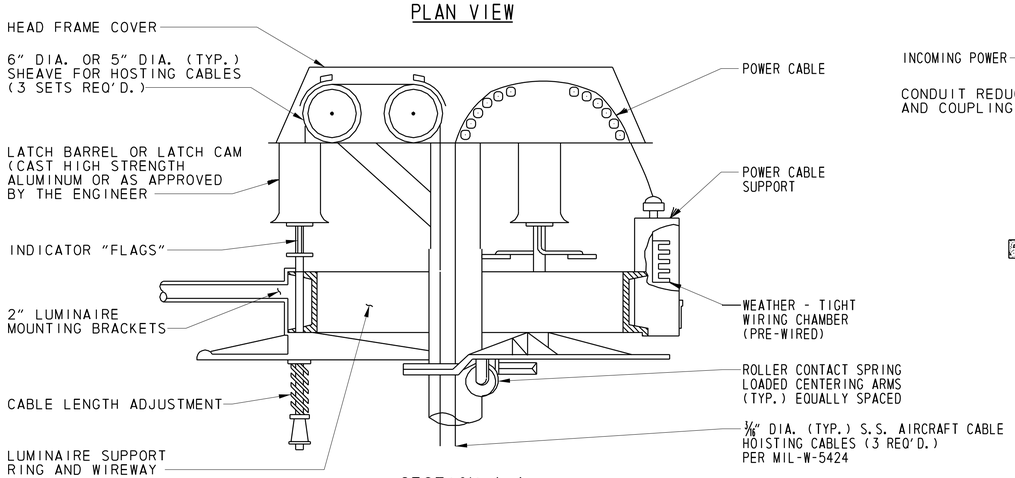
SCALE : NTS



ELEVATION



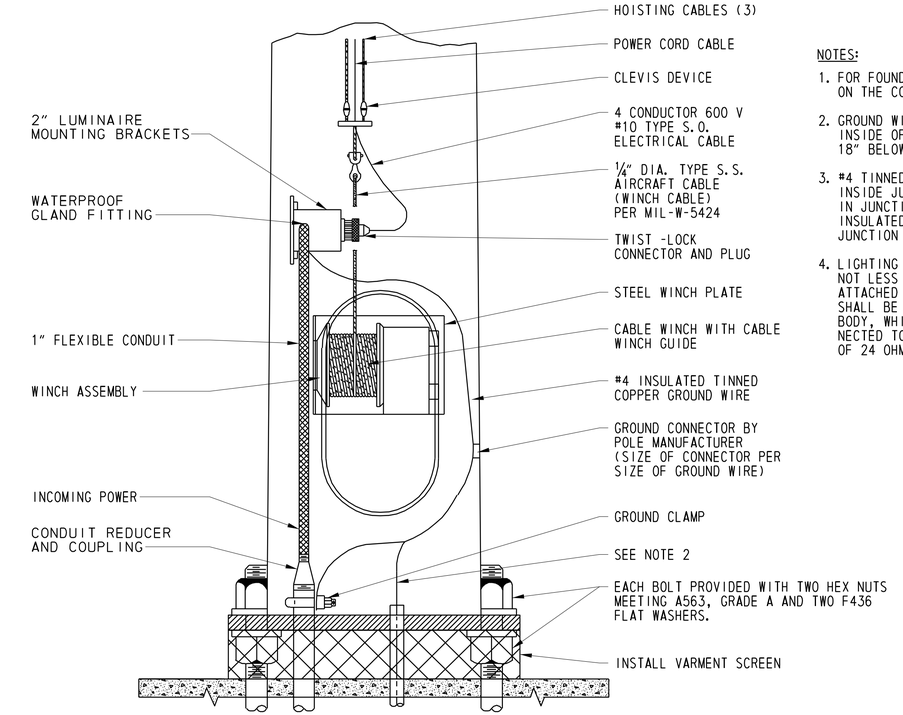
PLAN VIEW



SECTION A-A

LOWERING DEVICE

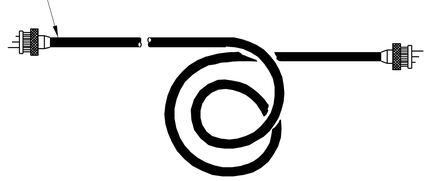
NOT TO SCALE



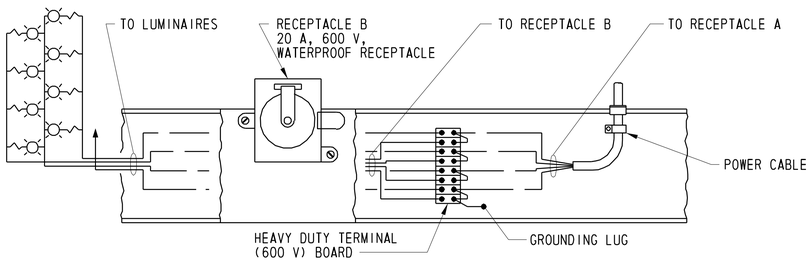
LOWERING DEVICE DETAIL

NOTES:

1. FOR FOUNDATIONS SEE SPECIAL DESIGNS AS SHOWN ON THE CONTRACT PLANS OR CONTACT ENGINEER.
2. GROUND WIRE TO BE BROUGHT THROUGH FOUNDATION INSIDE OF A ¾" METAL CONDUIT. CONDUIT SHALL BE 18" BELOW GRADE AND SHALL BE BUSHED.
3. #4 TINNED BARE COPPER GROUND WIRE WITH 2' SLACK INSIDE JUNCTION BOX. THERMO WELD TO GROUND ROD IN JUNCTION BOX AND CONNECT TO GROUNDED TYPE INSULATED BUSHINGS ON ALL METAL CONDUITS IN JUNCTION BOX.
4. LIGHTING PROTECTION - A STAINLESS STEEL SPIKE NOT LESS THAN SIX INCHES IN LENGTH SHALL BE ATTACHED TO THE TOP OF THE POLE. THIS SPIKE SHALL BE CONNECTED ELECTRICALLY TO THE POLE BODY, WHICH IN TURN SHALL BE ELECTRICALLY CONNECTED TO A POSITIVE GROUND, MAXIMUM RESISTANCE OF 24 OHMS PER GROUND ROD TO GROUND.

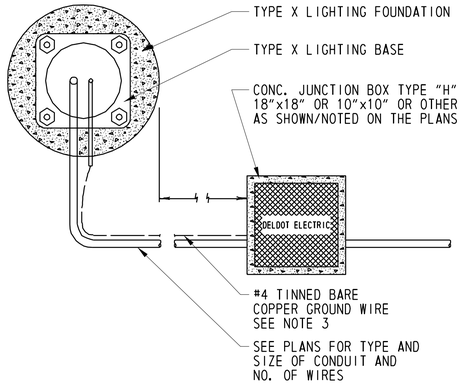


SERVICE CORD DETAIL



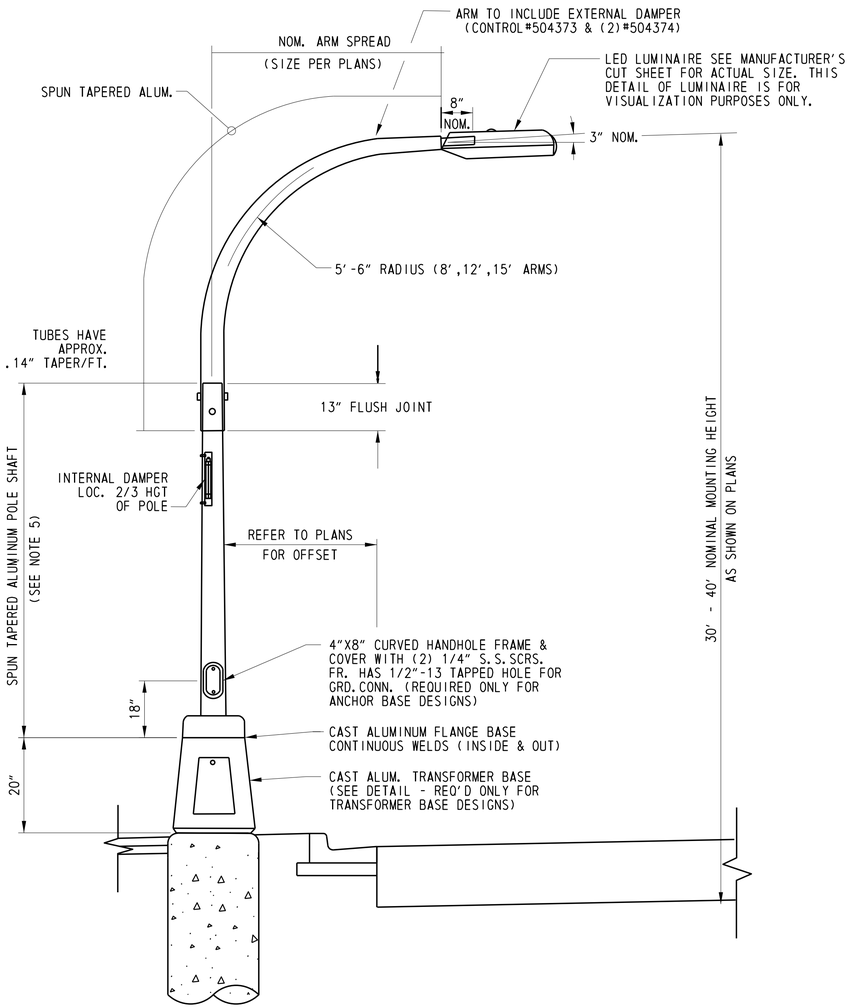
LUMINAIRE SUPPORT WIRING DETAIL

NOT TO SCALE



TYPICAL CONDUIT DETAIL

DELAWARE DEPARTMENT OF TRANSPORTATION	HIGHMAST LIGHTING			APPROVED	SIGNATURE ON FILE (CHIEF ENGINEER) // (DATE)
	STANDARD NO. T-#(2011)	SHT. 1 OF 1		RECOMMENDED	SIGNATURE ON FILE (DESIGN ENGINEER) // (DATE)

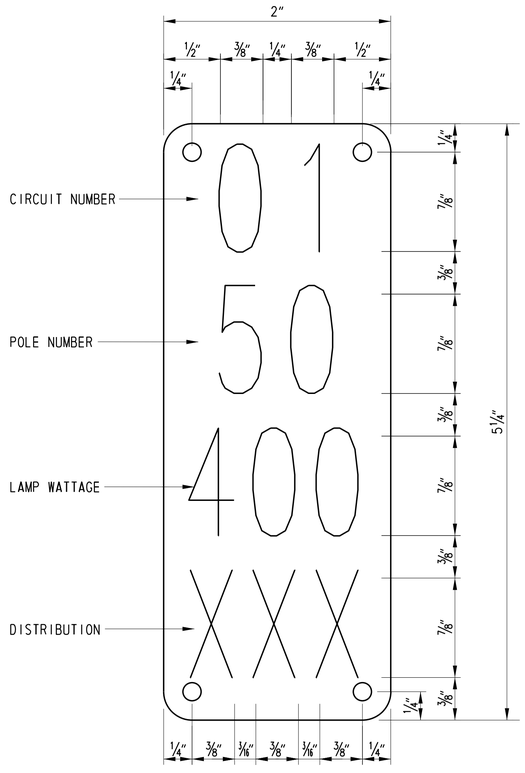


ALUMINUM LIGHTING STANDARD WITH SINGLE DAVIT ARM

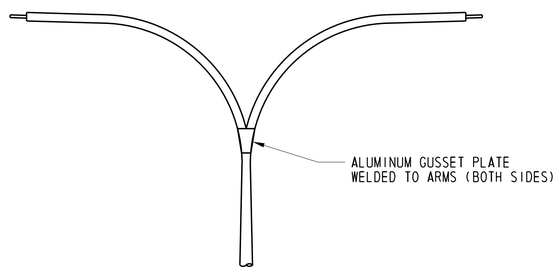
NOT TO SCALE

NOTES:
1. HEAT TREAT POLE & DAVIT TO -T6, TEMPER AFTER WELDING.
2. FINISH - POLE & DAVIT SHALL BE SATIN FINISHED POLISHED AND WRAPPED.
3. DESIGNED IN ACCORDANCE WITH STANDARDS ESTABLISHED BY THE LATEST EDITION OF AASHTO REQUIREMENTS.
4. TRANSFORMER SHALL MEET THE STANDARDS ESTABLISHED BY THE LATEST EDITION OF AASHTO BREAKAWAY REQUIREMENTS.
5. DUE TO VARYING ELEVATIONS OF ROADWAY, IT MAY BE NECESSARY TO MAINTAIN A NOMINAL FIXTURE MOUNTING HEIGHT (OF 30' OR 40', AS SPECIFIED ON PLANS) ABOVE THE ROADWAY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THESE MEASUREMENTS. BETWEEN TWO ADJACENT LUMINAIRES, THE DIFFERENCE IN HEIGHT SHALL NOT EXCEED 12".

MATERIAL SPECIFICATION	
POLE & DAVIT TUBES	*6063-T6*
ANCHOR BASE	*AA356-T6*
BOLT COVERS	*AA356*
ANCHOR BOLT NUTS	*ASTM-A563 GR. A*
ANCHOR BOLTS	*ASTM-F1554 GR55*
STN. STL. HARDWARE	*AISI-300 SERIES SST*
TRANSFORMER BASE	*AA356-T6*
T-BASE HARDWARE	*ASTM-A325 GALV.*



TYPICAL POLE IDENTIFICATION TAG



TWIN DAVIT ARM

LIGHT STANDARDS AND LUMINAIRES

NOT TO SCALE

NOTES:
1. IDENTIFICATION TAG SHALL BE INSTALLED ON THE SIDE OF THE POLE FACING AWAY FROM TRAFFIC.
2. POLE ARMS SHALL BE ALIGNED PERPENDICULAR TO THE EDGE OF TRAVELED WAY, UNLESS OTHERWISE DIRECTED.
3. THE OUTER SLEEVE MEMBER AT THE LIGHT STANDARD FLUSH JOINT SHALL BE FURNISHED WITH PREDRILLED THROUGH HOLES AT 90 DEGREES APART (MIN. 6" DISTANCE BETWEEN HOLES). THE INNER MEMBER SHALL BE DRILLED IN THE FIELD AFTER THE POLE SHAFT IS INSTALLED AND THE DAVIT ARM IS ALIGNED.
4. LAMP TYPE, WATTAGE AND HORIZONTAL DISTRIBUTION TYPE SHALL BE AS SPECIFIED ON THE PLANS. ALL LUMINAIRES SHALL BE MOUNTED AT A ZERO DEGREE TILT ANGLE. PHOTO CONTROL SHALL BE LOCATED AT THE LIGHTING CONTROL CENTER ENCLOSURE, UNLESS OTHERWISE NOTED.
5. LUMINAIRES SHALL HAVE CUTOFF OPTICS, AND BE LABELLED WITH AN IDENTIFICATION STICKER IN ACCORDANCE WITH NEMA CONVENTIONS.

SCALE : NTS

DELAWARE
DEPARTMENT OF TRANSPORTATION

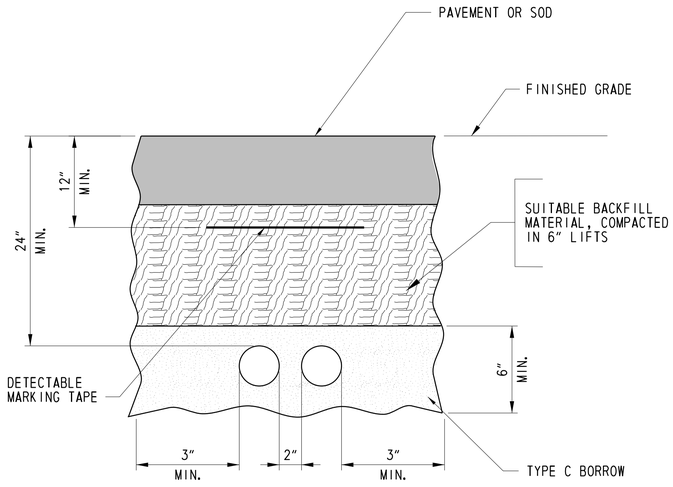
LIGHT STANDARDS AND LUMINAIRES

STANDARD NO. T-#(2011) | SHT. 1 OF 1

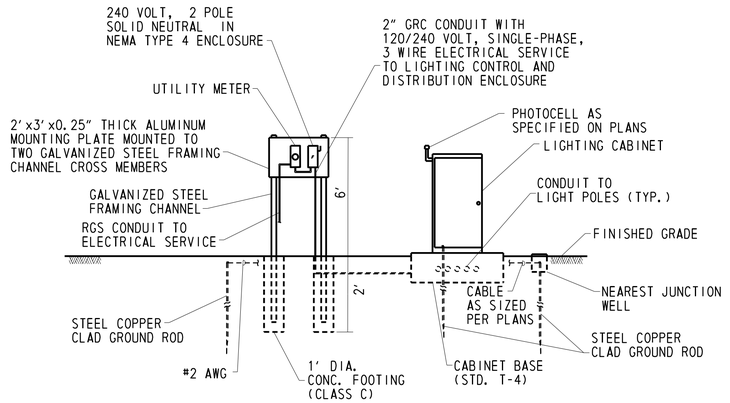
APPROVED SIGNATURE ON FILE — CHIEF ENGINEER — DATE / /

RECOMMENDED SIGNATURE ON FILE — DESIGN ENGINEER — DATE / /

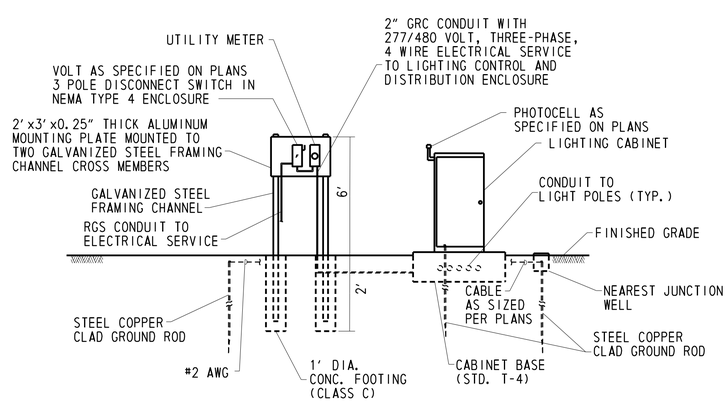
SCALE : NTS



BURIED CONDUIT DETAIL



ELECTRICAL UTILITY SERVICE EQUIPMENT AND LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE DETAIL (120/240V)

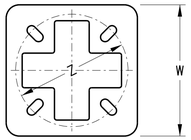


ELECTRICAL UTILITY SERVICE EQUIPMENT AND LIGHTING CONTROL AND DISTRIBUTION ENCLOSURE DETAIL (277/480V)

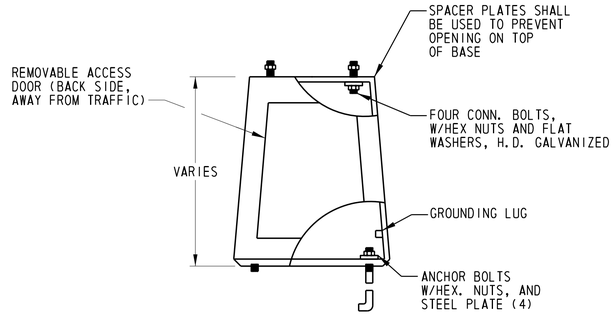
DELAWARE DEPARTMENT OF TRANSPORTATION	MISCELLANEOUS LIGHTING DETAILS		APPROVED	SIGNATURE ON FILE (CHIEF ENGINEER) // (DATE)
	STANDARD NO. T-#(2011)	SHT. 1 OF 1	RECOMMENDED	SIGNATURE ON FILE (DESIGN ENGINEER) // (DATE)

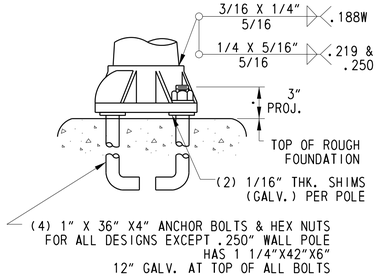
SCALE : NTS

MOUNTING HEIGHT	ARM LENGTH	MIN WIDTH 'W'	BOLT DIA.	BOLT CIRCLE 'Z'
LESS THAN 40'	LESS THAN 30'	13"	1"	13½"
40'	LESS THAN OR EQUAL TO 20'	13"	1"	13½"



TOP VIEW

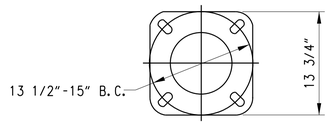




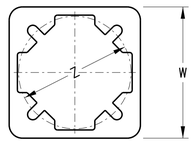
CONSTRUCTION NOTES:

1. ALUMINUM TRANSFORMER BASE SHALL MEET THE CURRENT AASHTO BREAKAWAY REQUIREMENTS.
2. BREAKAWAY TRANSFORMER BASES SHALL BE INSTALLED WITH ALL POLES, UNLESS OTHERWISE NOTED.
3. LIGHT STANDARDS MOUNTED TO BRIDGE/RETAINING/BARRIER WALLS DO NOT REQUIRE BREAKAWAY BASES.
4. OPENING OF TRANSFORMER BASE ACCESS DOOR SHALL BE INSTALLED ON THE SIDE OF THE POLE FACING AWAY FROM TRAFFIC.
5. PROVIDE ACCESSIBLE GROUNDING NUT OR LUG INSIDE TRANSFORMER BASE.
6. PROVIDE WASHERS, SHIMS AND BOLTS AS REQUIRED BY TRANSFORMER BASE MANUFACTURER.
7. THE CONTACT AREA BETWEEN THE TRANSFORMER BASE AND CONCRETE FOUNDATION SHALL BE SHOP COATED WITH COAL TAR EPOXY MEETING SSPC-PAINT 16 SPECIFICATIONS. THE THICKNESS OF THE COATING SHALL BE BETWEEN 6 AND 8 MILS. THE COATING SHALL BE COMPLETELY DRY BEFORE INSTALLATION. THE TOP OF THE FOUNDATION SHALL NOT BE PAINTED.
8. TOP AND BOTTOM OF BASE MAY BE SLOTTED FOR BOLT CIRCLE. SLOT MUST ACCOMMODATE DIMENSION SHOWN.
9. TRANSFORMER BASE AND ASSOCIATED COMPONENTS SHALL MEET THE FOLLOWING MATERIAL REQUIREMENTS:

MATERIAL SPECIFICATION	
POLE & DAVIT TUBES	6063-T6
ANCHOR BASE	AA356-T6
BOLT COVERS	AA356
ANCHOR BOLT NUTS	ASTM-A563 GR. A
ANCHOR BOLTS	ASTM-F1554 GR55
STN. STL. HARDWARE	AISI-300 SERIES STN. STL.
TRANSFORMER BASE	AA356-T6
T-BASE HARDWARE	ASTM-A325 GALV.



ANCHOR BASE DETAIL
NOT TO SCALE

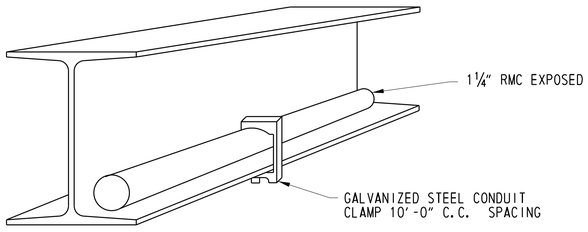


BOTTOM VIEW

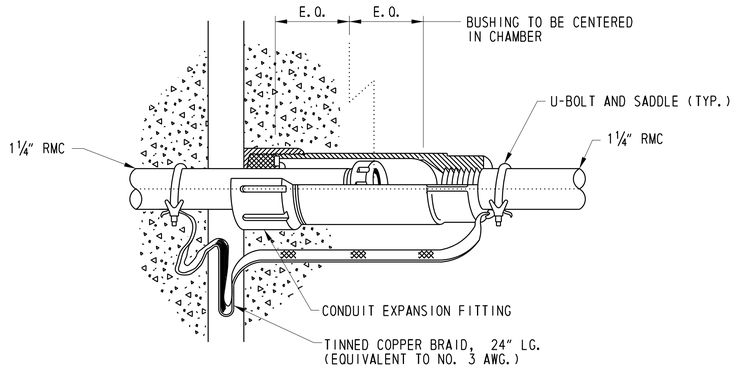
LIGHTING STRUCTURE ON BREAKAWAY TRANSFORMER BASE
NOT TO SCALE

DELAWARE DEPARTMENT OF TRANSPORTATION	LIGHTING STRUCTURE ON BREAKAWAY TRANSFORMER BASE		APPROVED	SIGNATURE ON FILE — CHIEF ENGINEER	/ / DATE
	STANDARD NO. T-#(2011)	SHT. 1 OF 1	RECOMMENDED	SIGNATURE ON FILE — DESIGN ENGINEER	/ / DATE

SCALE : NTS

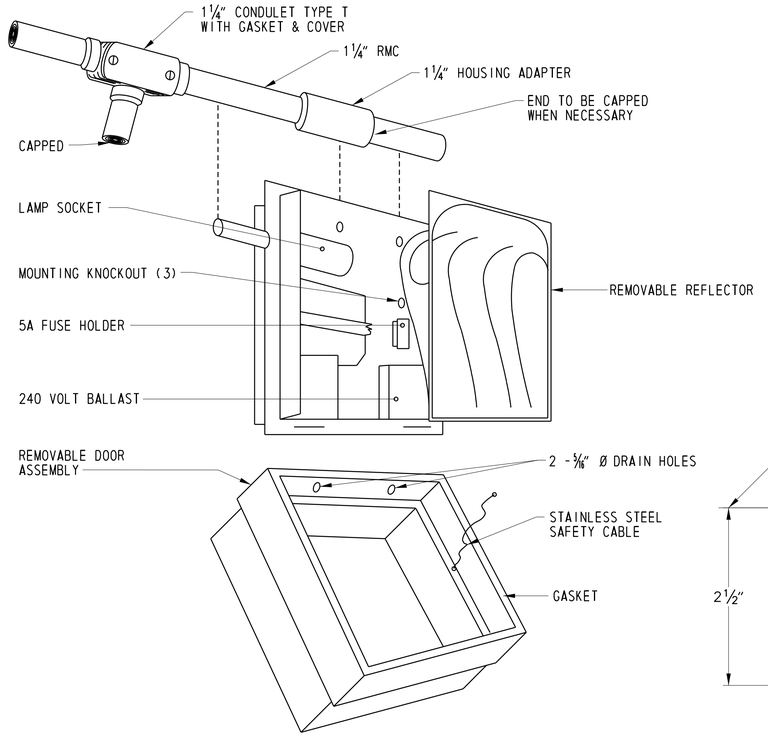


CONDUIT MOUNTING ON BRIDGE MEMBER

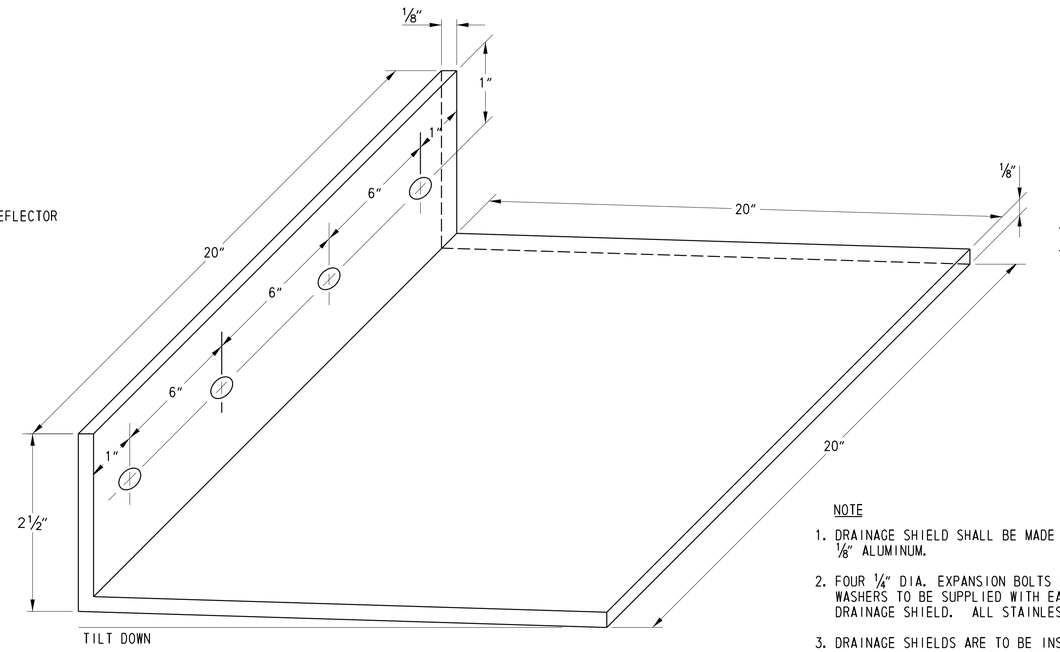


TYPICAL DETAIL
CONDUIT EXPANSION FITTING

NOTES:
1. EXPANSION FITTING TO BE INSTALLED AT ALL EXPANSION JOINTS
2. RIGID METALLIC CONDUIT AND FITTING SHALL BE HOT-DIPPED GALVANIZED.

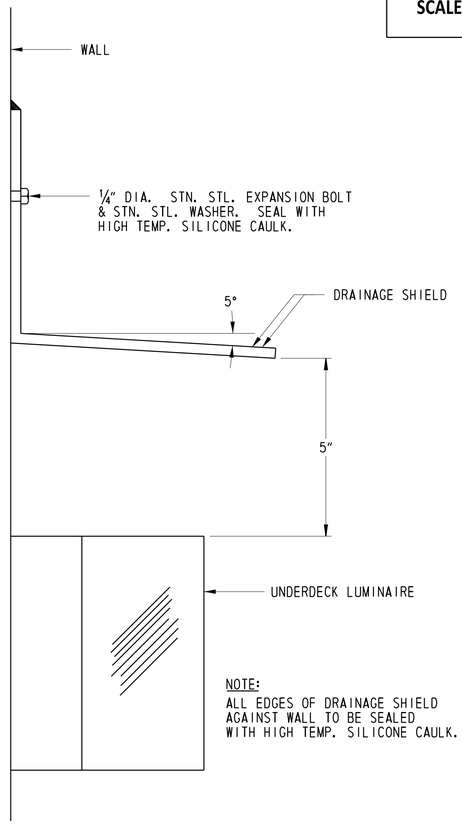


TYPICAL ULA MOUNTING



DRAINAGE SHIELD DETAIL
FROM NJDOT

NOTE
1. DRAINAGE SHIELD SHALL BE MADE OF 1/8" ALUMINUM.
2. FOUR ¼" DIA. EXPANSION BOLTS AND WASHERS TO BE SUPPLIED WITH EACH DRAINAGE SHIELD. ALL STAINLESS STEEL.
3. DRAINAGE SHIELDS ARE TO BE INSTALLED AT A DISTANCE OF 5" FROM TOP OF UNDERDECK LUIMINAIRE.

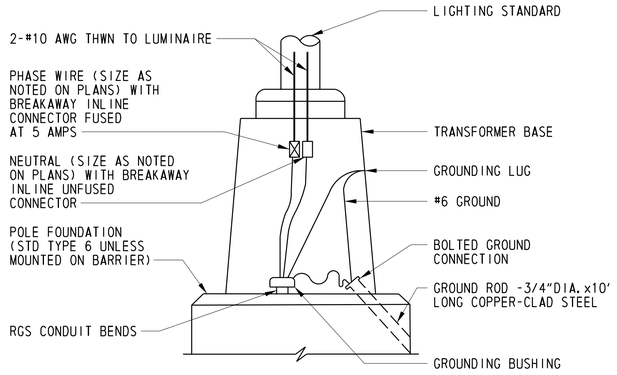


NOTE:
ALL EDGES OF DRAINAGE SHIELD AGAINST WALL TO BE SEALED WITH HIGH TEMP. SILICONE CAULK.

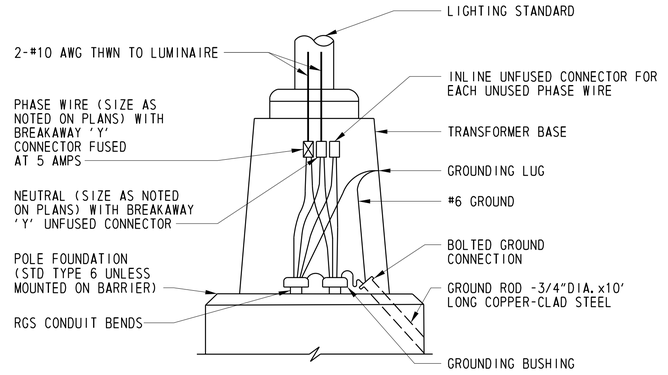
TYPICAL DRAINAGE SHIELD INSTALLATION

DELAWARE DEPARTMENT OF TRANSPORTATION	UNDERDECK LIGHTING		APPROVED	SIGNATURE ON FILE (CHIEF ENGINEER) // (DATE)
	STANDARD NO. T-#(2011)	SHT. 1 OF 1	RECOMMENDED	SIGNATURE ON FILE (DESIGN ENGINEER) // (DATE)

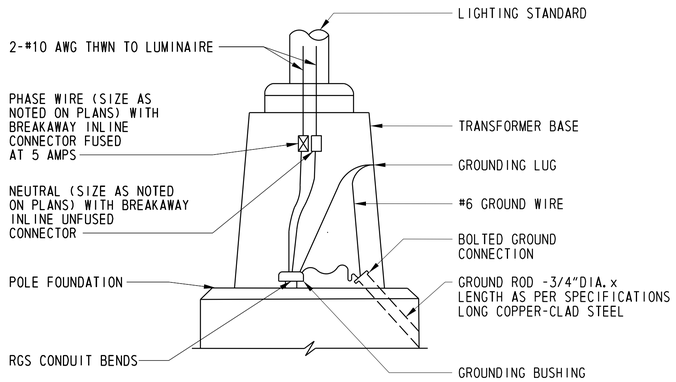
SCALE : NTS



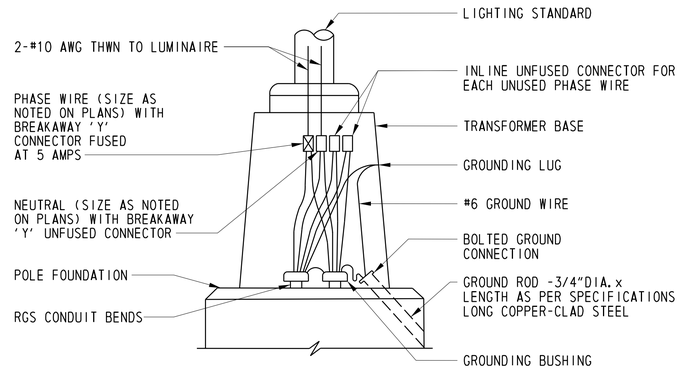
TYPICAL LUMINAIRE CONNECTION
END OF CABLE RUN
120/240 VOLT
NOT TO SCALE



TYPICAL LUMINAIRE CONNECTION
CONTINUOUS CABLE RUN
120/240 VOLT
NOT TO SCALE



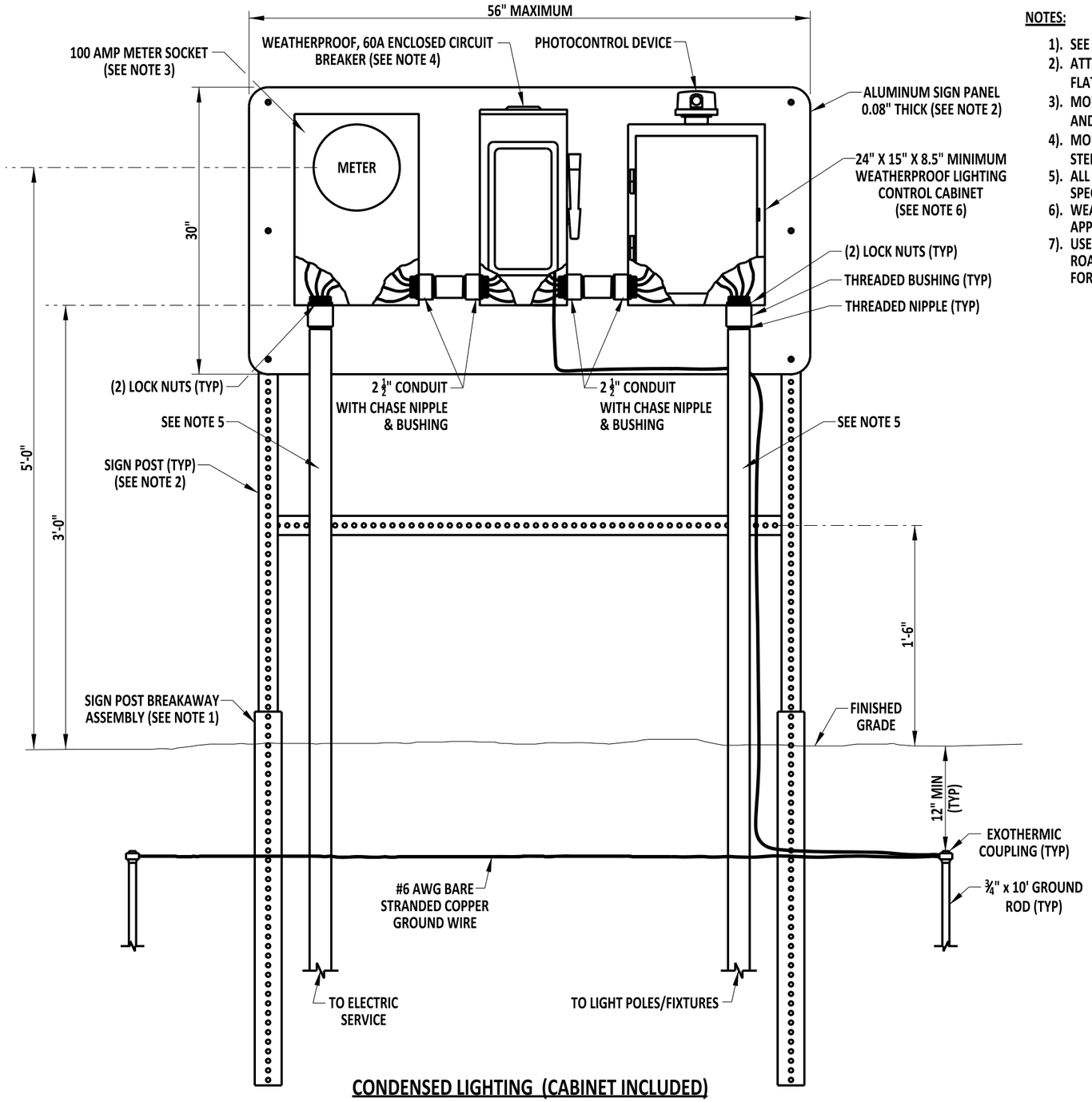
TYPICAL LUMINAIRE CONNECTION
END OF CABLE RUN
277/480 VOLT
NOT TO SCALE



TYPICAL LUMINAIRE CONNECTION
CONTINUOUS CABLE RUN
277/480 VOLT

WIRING STRUCTURE TRANSFORMER BASE
NOT TO SCALE

DELAWARE DEPARTMENT OF TRANSPORTATION	WIRING SCHEMATIC IN TRANSFORMER BASE			APPROVED	SIGNATURE ON FILE (CHIEF ENGINEER) // (DATE)
	STANDARD NO. T-#(2011)	SHT. 1	OF 1	RECOMMENDED	SIGNATURE ON FILE (DESIGN ENGINEER) // (DATE)



CONDENSED LIGHTING (CABINET INCLUDED)

NOTES:

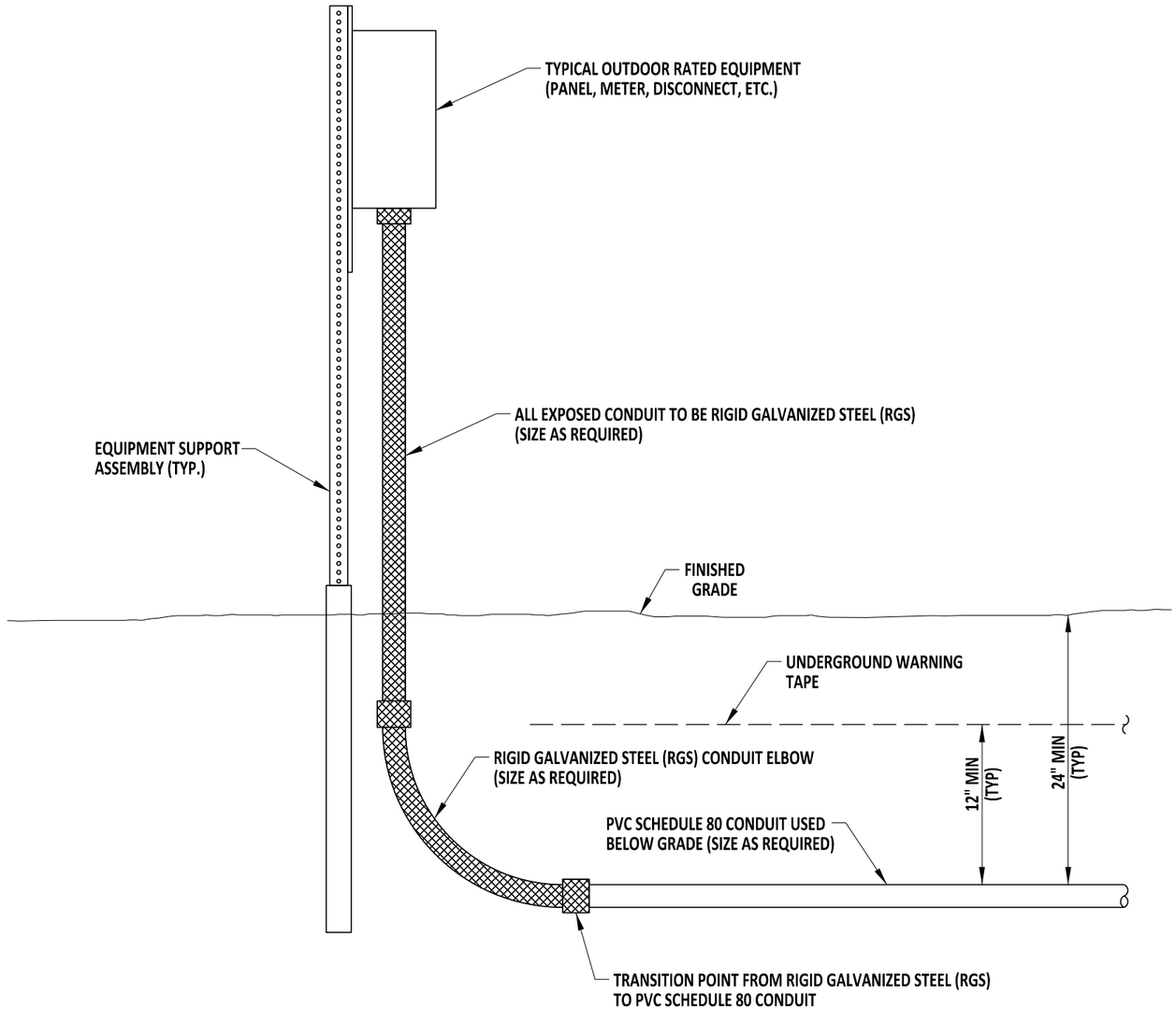
1). SEE DETAIL T-15, SHEET 1, FOR SIGN POST AND BREAKAWAY ASSEMBLY DETAILS.
2). ATTACH ALUMINUM PANEL TO SIGN POSTS WITH (6) 5/16" x 2½" LONG GRADE 5 BOLTS, FLAT WASHERS, AND NYLON LOCK NUTS, 3 ON EACH SIDE.
3). MOUNT METER SOCKET TO ALUMINUM PANEL WITH (4) 5/16" x ¾" STAINLESS STEEL BOLTS AND NYLON LOCK NUTS.
4). MOUNT ENCLOSED CIRCUIT BREAKER TO ALUMINUM PANEL WITH (4) 5/16" x ¾" STAINLESS STEEL BOLTS AND NYLON LOCK NUTS.
5). ALL CONDUITS AND OTHER ASSOCIATED PIECES SHALL BE 2" GALVANIZED UNLESS SPECIFIED DIFFERENTLY ON THE PLANS OR BY LOCAL UTILITY COMPANY.
6). WEATHERPROOF LIGHTING CONTROL CABINET SHALL CONTAIN LIGHTING CONTACTOR AND APPROPRIATE OVERCURRENT PROTECTION FOR LIGHTING CIRCUIT(S) BEING USED.
7). USE OF THESE DETAILS ARE MEANT FOR SMALLER INTERSECTION LIGHTING SYSTEMS, OR ROADWAY LIGHTING INSTALLATIONS WITH LOADS APPROXIMATELY 12 FIXTURES OR LESS. FOR LARGER LIGHTING INSTALLATIONS, SEE DETAIL T-17, 4 OF 5.

ELECTRICAL SERVICE PEDESTAL - SIGNAL & ITS COMPONENT INSTALLATIONS
LIGHTING COMPONENT INSTALLATIONS (12 OR LESS FIXTURES)

DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	NOT TO SCALE	LIGHTING DESIGN DETAILS	CONTRACT / COUNTY	BRIDGE NO. / DESIGNED BY: / CHECKED BY:	SP CABINET DETAIL	SHEET NO. / TOTAL SHTS.

PLOTTED BY: KREHM DATE: 6/19/2020
FILE LOCATION: C:\USERS\KREHM\ONEDRIVE - JOHNSON, MIRMIRAN & THOMPSON\LIGHTING GUIDELINES\STANDARD DETAIL_T17-5.DGN [SHEET1]

SCALE : NTS



RGS TO PVC CONDUIT TRANSITION DETAIL

DELAWARE DEPARTMENT OF TRANSPORTATION	RGS TO PVC CONDUIT TRANSITION DETAIL		APPROVED SIGNATURE ON FILE (CHIEF ENGINEER) _/_/___ (DATE)
	STANDARD NO.	SHT. OF	RECOMMENDED SIGNATURE ON FILE (DESIGN ENGINEER) _/_/___ (DATE)

APPENDIX O.
SAMPLE COST ESTIMATE

NOTE: PLEASE CHECK DELDOT'S WEBSITE FOR THE LATEST UPDATES (https://deldot.gov/Business/drc/index.shtml?dc=traffic)

TRAFFIC STATEMENT

Date : April 24, 2018

DelDOT Traffic
169 Brick Store Landing Rd
Smyrna, Delaware 19977

To : Thomas Craig
PS&E Project Coordinators

From : Mir Wahed *Mir Wahed*
Traffic Systems Design Engineer

Ref : Contract Number : T201701004 F.A.P. # :
Project Title : Boxwood Road Interchange Lighting Design

[ ] No Involvement by Traffic

[ ] PS&E Attached, Signal Involvement

[ ] PS&E Attached, ITMS Involvement

[XX] PS&E Attached, Highway Lighting Involvement

[ ] PS&E Attached, Signing Involvement

cc: Eddie Toulson, Traffic Operations Manager
Amanda Davis, Support Services Administrator
Earle Timpson, Assistant Director of Finance
Xxxxx Name, Project Engineer/Designer
Traffic Project File Copy

TRAFFIC PROJECT COST SUMMARY

Boxwood Road Interchange Lighting Design

T201701004

DESCRIPTION	ENGINEER'S ESTIMATE
TOTAL HIGHWAY LIGHTING ESTIMATE	$558,071.89

TOTAL ESTIMATE FOR PROJECT ---->	**$558,071.89**

DELAWARE DEPARTMENT OF TRANSPORTATION

HIGHWAY LIGHTING ESTIMATE

Boxwood Road Interchange Lighting Design

CONTRACT #: T201701004
F.A.P. #:
PROJECT: Boxwood Road Interchange Lighting Design

						UNIT COST		TOTAL COST	
LINE	#	ITEM #	QTY	UOM	DESCRIPTION - (PROJECT CONTRACTOR ITEMS)	A	B	A	B
1									
					TOTAL PROJECT CONTRACTOR ITEMS	→	→		

LINE	#	ITEM #	QTY	UOM	DESCRIPTION - (TRAFFIC CONTRACTOR ITEMS)	UNIT COST		TOTAL COST	
						A	B	A	B
1	340	830001	17	EA	CONDUIT JUNCTION WELL, TYPE 1, 20"X20" PRECAST CONCRETE	1152.00	1100.00	19,584.00	18,700.00
2	345	830002	1	EA	CONDUIT JUNCTION WELL, TYPE 4, 20"X42 1/2" PRECASTCONCRETE	1330.00	1300.00	1,330.00	1,300.00
3	260	831002	1010	LF	Furnish & Install up to 4" Schedule 80 HDPE Conduit (Bore)	32.50	34.00	32,825.00	34,340.00
4	270	831004	7020	LF	Furnish & Install up to 4" Schedule 80 PVC Conduit (Trench)	12.00	12.00	84,240.00	84,240.00
5	280	831006	105	LF	Furnish & Install up to 4" Galvanized Steel Conduit (Trench)	23.00	23.00	2,415.00	2,415.00
6	35	832006	25520	LF	Furnish & Install 1-conductor #2 AWG Stranded Copper	3.00	3.00	76,560.00	76,560.00
7	40	832007	9295	LF	Furnish & Install 1-conductor #4 AWG Stranded Copper	2.70	2.75	25,096.50	25,561.25
8	620	834006	32	EA	Pole Base Type 6	890.00	950.00	28,480.00	30,400.00
9	15	835002	1	EA	Cabinet Base Type M	930.00	900.00	930.00	900.00
10	305	746925	1	EA	Electric Service Pedstal-Lighting, Signal & ITMS Component Installation	1350.00	1560.00	1,350.00	1,560.00
11		847006	1	EA	Lighting Control Cabinet	1598.00	1598.00	1,598.00	1,598.00
12		211000	1	LS	Removal of Structures and Obstructions	25086.50	25086.50	25,086.50	25,086.50
13		850011	34	EA	Removal of Luminaire	150.00	150.00	5,100.00	5,100.00
14		830010	15	EA	Removal of Existing Junction Well	400.00	400.00	6,000.00	6,000.00
15									
16		908004	15.5	SY	Topsoil, 6" Depth	135.00	135.00	2,092.50	2,092.50
17		908014	15.5	SY	Permanent Grass Seeding, Dry Ground	7.00	7.00	108.50	108.50
18		209006	3.3	CY	Borrow, Type F	13.00	13.00	42.90	42.90
19									
20		204000	5	EA	Test Hole	950.00	950.00	4,750.00	4,750.00
21									
22	440	802003	15	EA-DY	Arrow Panels, Type C	45.00	40.00	675.00	600.00
23	455	805001	4592	EA-DY	Plastic Drums	3.00	4.00	13,776.00	18,368.00
24	470	808002	90	EA-DY	Furnish & Maintain Truck Mounted Attenuator, Type II	255.00	185.00	22,950.00	16,650.00
25	480	810001	480	EA-DY	Temporary Warning Signs and Plaques	18.00	12.00	8,640.00	5,760.00
26									
27									
28									
29									
30									
					TOTAL TRAFFIC CONTRACTOR ITEMS	→	→	363,629.90	362,132.65

LINE	#	ITEM #	QTY	UOM	DESCRIPTION - (TRAFFIC SUPPLY ITEMS)	UNIT COST A	UNIT COST B	TOTAL COST A	TOTAL COST B
1	881	999427	1	EA	Base Extension (split) Aluminum w/Natural Mill Finish	550.00	550.00	550.00	550.00
2		851001	4	EA	Aluminum Lighting Standard with Single Davit Arm, 30' Pole	2000.00	2000.00	8,000.00	8,000.00
3		851003	32	EA	Aluminum Lighting Standard with Single Davit Arm, 40' Pole	2800.00	2800.00	89,600.00	89,600.00
4		850504	6	EA	LED Luminaire - Underpass Lighting Fixture (50 W)	800.00	800.00	4,800.00	4,800.00
5		850503	32	EA	Luminaire (LED), 400 W HPS Equivalent	500.00	500.00	16,000.00	16,000.00
6		850501	6	EA	Luminaire (LED), 150 W HPS Equivalent	450.00	450.00	2,700.00	2,700.00
7									
8									
9									
10									
11									
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25									
26									
27									
28									
29									
30									
					TOTAL TRAFFIC SUPPLY ITEMS	→	→	121,650.00	121,650.00

TOTAL PROJECT CONTRACTOR ITEMS	→ →	→ →			
TOTAL TRAFFIC CONTRACTOR ITEMS	→ →	→ →	363,629.90	362,132.65	
TOTAL TRAFFIC SUPPLY ITEMS	→ →	→ →	121,650.00	121,650.00	
CONTINGENCIES	→ →	→ →	72,791.99	72,567.40	
TOTAL COST	→ →	→ →	558,071.89	556,350.05	

APPENDIX P.
SAMPLE LIGHTING TECHNICAL MEMORANDUM

1. LLF calculation for outdoor LED Luminaires
2. Use of Non-Cutoff LED light fixtures

MEMORANDUM

TO:	Max Saintil
DATE:	January 2, 2019
REVISED:	May 4, 2020
FROM:	Mir Wahed; Stan Lozovatsky
PROJECT:	Light Loss Factor (LLF) for Outdoor LED Luminaires
CC:	Mark Luszcz, Naa-Atswei Tetteh, Joe LaCotti,

This memorandum discusses the results of JMT's work with researching and developing the ideal Light Loss Factor (LLF) to use for roadway LED lighting calculations for DelDOT designs.

All lighting systems will suffer reductions in performance over time, slowly reducing their lumen output due to a range of recoverable and non-recoverable factors. From dust or dirt on the fixture, to the depreciation of the lamp itself, over time the performance of the luminaire will degrade, slowly decreasing from its initial lumen output. This loss of performance is typically accounted for during the photometric calculation process by incorporating a LLF. The LLF consists of a combination of different metrics which are then multiplied together to form a single factor. This value is then applied during the lighting calculation phase of a project. Typically, the photometric IES file of a specific fixture, which is provided by the manufacturer, uses the initial lumen output value. By utilizing a LLF during the calculation phase, a more realistic average condition of the luminaire's light output can be simulated. Using a Light Loss Factor ensures that the lighting design utilizes pole spacings and arrangements that will provide effective illumination well past the initial lighting system installation.

There are two critical metrics that make up the Light Loss Factor calculation for DelDOT lighting projects: Lamp Dirt Depreciation (LDD) and the Lumen Maintenance Factor. These two values are explained in detail below:

Lamp Dirt Depreciation (LDD):

Lamp Dirt Depreciation is a set value that is used for all Light Loss Factor calculations, regardless of the LED fixture manufacturer or model. This metric is typically set by the state DOT where the work is being performed. DelDOT currently incorporates a LDD value of 0.9. JMT performed research to verify if this was an appropriate Lamp Dirt Depreciation factor to use. JMT examined documents from the IESNA (Illuminating Engineering Society North America), as well as investigating what other state DOT's are using for comparison purposes.

The IESNA RP-8-18 “Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting” book contains a figure (Figure 3-3) showing the LDD curves for various LED optics. The typical light fixtures used by DelDOT have Linear Molded Acrylic optics. For fixtures with these optics, the LDD follows the red curve in the table. Over time, the LDD curve approaches a value of 0.9.

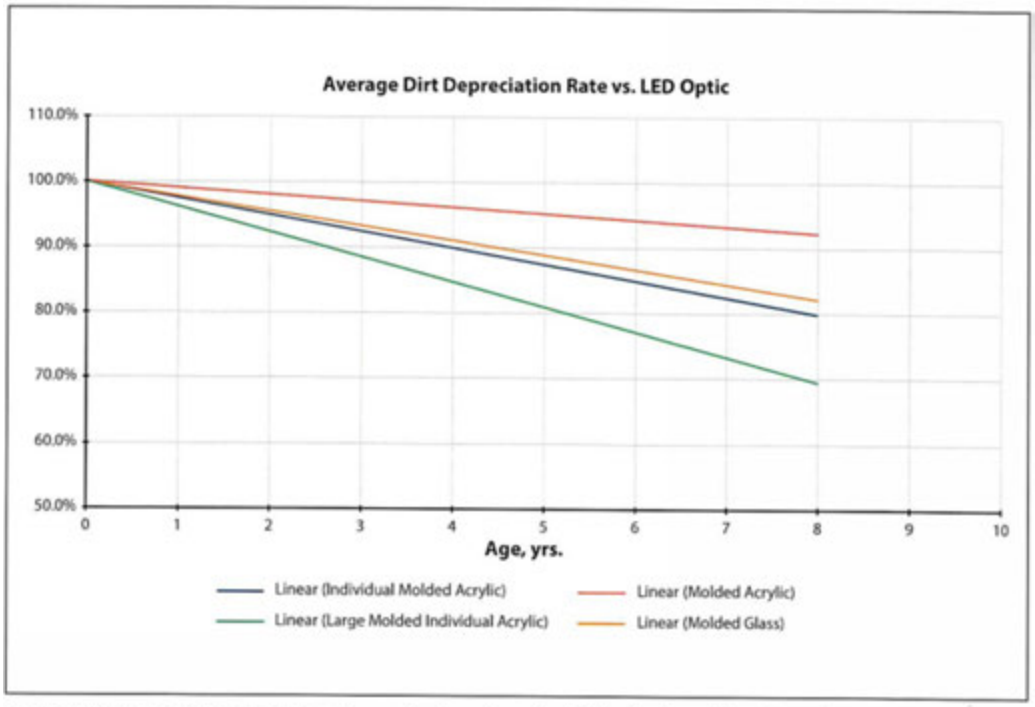


Figure 3-3. Average dirt depreciation rate as a function of age for LED luminaires with various glass or acrylic outer optics. (Source: IES RES-1-16[4])

JMT also researched and examined the Lamp Dirt Depreciation factors used by other state DOT’s. The compiled data is shown in the chart below.

State	LDD
Delaware (*Current*)	0.9
Virginia	0.85
New Jersey	0.9
Pennsylvania	0.8
Maryland	0.9
Minnesota	0.9
Indiana	0.87

Based on this information, JMT confirms that the 0.9 LDD value is appropriate for the fixtures that DelDOT typically uses.

Lumen Maintenance Factor (LMF):

Unlike the LDD metric which is typically set by the DOT, the Lumen Maintenance Factor is a factor provided by the luminaire manufacturer for a given fixture. This factor is typically based on extrapolated data which is collected by the testing of a luminaire. This factor expresses the reduction in lumen output of a given fixture over a specific time period. The LMF is typically presented as a percentage of the initial lumen output at 60,000 hours. Some manufacturers use alternate durations of time to calculate their Lumen Maintenance Factor. In these cases, JMT recommends extrapolating this data to the 60,000-hour mark so that all fixtures are compared using the same lumen maintenance criteria. Below is an example of how a manufacturer would typically present the Lumen Maintenance Factor data on a fixture cutsheet is shown below:

Predicted Lumen Depreciation Data

Predicted performance derived from LED manufacturer's data and engineering design estimates, based on IESNA LM-80 methodology. Actual experience may vary due to field application conditions. L_{70} is the predicted time when LED performance depreciates to 70% of initial lumen output. Calculated per IESNA TM21-11. Published L_{70} hours limited to 6 times actual LED test hours

Ambient Temperature °C	Driver mA	Calculated L_{70} Hours	L_{70} per TM-21	Lumen Maintenance % at 60,000 hrs
25°C	up to 1050 mA	>100,000 hours	>60,000 hours	>96%

Testing of the LED fixtures is dictated by the IESNA LM-80-08, "*The Approved Method for Measuring Lumen Maintenance of LED Light Sources*". The data from that testing is then extrapolated to determine the theoretical life span of the LED fixture based on the IESNA TM-21-11, "*Projecting Long Term Lumen Maintenance of LED Light Sources*".

The final Light Loss Factor can be applied to any luminaire IES file being used in a photometric calculation by multiplying the two factors described above, together. For this particular light fixture the light loss factor should be calculated as shown below:

$$LLF = LDD * LMF = 0.9 * 0.96 = 0.86$$

All designers should follow the method described above to calculate LLF. Additional information also provided in Chapter 4 of the DelDOT Traffic Lighting Policy.

MEMORANDUM

TO:	Mark Luszcz
DATE:	September 6, 2017
FROM:	Mir Wahed; Gillian Bruno
PROJECT:	Elkton Road Improvements, Maryland State Line to Casho Mill Road; DelDOT Contract No. T201504401
JMT JOB NO.:	14-0659-007
RE:	Use of Non-Cutoff Angled LED Flood Lighting at Elkton Road Intersections in Accordance with AASHTO and DelDOT Lighting Levels
CC:	Denny Hehman; Max Saintil; Bryan Behrens; Tom Coleman

This memorandum details the need to use LED flood lights at the intersections of SR 2 (Elkton Road)/SR 4 (Christina Parkway) and SR 2 (Elkton Road)/Otts Chapel Road. The intersections will be illuminated in accordance with Delaware Department of Transportation (DelDOT) Lighting Design Guidelines Revised October 2012 and the American Association of State Highway and Transportation Officials (AASHTO) - recommended lighting levels.

Background

The project being discussed includes the widening and improvements on Elkton Road from west of Casho Mill Road to the Maryland State Line, including roadway lighting improvements. Most of the existing lighting is made up of utility pole mounted 250 watt fixtures, supplemented by some privately owned street lights located on side streets.

During a meeting between DelDOT Traffic and JMT on April 7, 2016, the lighting warrants for this project were reviewed. It was stated that both the Elkton Road/SR 4 intersection and the Elkton Road/Otts Chapel Road intersection met the ‘should’ warranting conditions due to ADT volumes and roadway classifications, so they would be lit. The Elkton Road/McIntire Drive intersection barely met the ‘may’ warranting conditions due to ADT volumes, however the City of Newark had asked in a previous meeting, on August 11, 2015, that lighting be installed at the McIntire Drive intersection due to safety concerns with the existing Dunkin Donuts and school entrance.

At the meeting with the City of Newark they agreed to maintain proposed lights along this Elkton Road corridor, but only if the fixtures were LEDs. At the April 7, 2016, meeting, DelDOT agreed that LED fixtures could be used for the Elkton Road lighting design. On June 16, 2017, as per a DelDOT memorandum, LED roadway lighting was adopted as standard for all DelDOT projects.

The lighting design at McIntire Drive was updated as per direction from DelDOT Traffic on August 8, 2017, to utilize all utility pole mounted fixtures, therefore eliminating involvement from DelDOT maintenance personnel, and resulting in the City of Newark taking over ownership of the lighting at the intersection.

Intersection Geometry

The three existing intersections along SR 2 (Elkton Road) will undergo geometric modifications, including the addition of one through lane for eastbound SR 2 between Otts Chapel Road and SR 4, the addition of turn lanes for all the approaches, and the installation of pork chop islands for right-turn lanes. At some intersections, the proposed geometry of SR 2 is as wide as seven lanes (with turn lanes) in addition to a grass median.

Lighting Design

The DelDOT Lighting Design Manual and the AASHTO recommended average lighting levels for the intersections along SR 2 (Elkton Road) are 1.2 foot-candles, which is reflective of the 'Other Principal Arterial' classification of SR 2, for Intermediate uses. At all the intersections the recommended average to minimum illuminance uniformity ratio is a maximum of 3:1 (average/minimum). A light loss factor of 0.75 was used for all fixtures tested on this project.

The number of lanes creates a wide area to be illuminated at the intersection. The channelized right-turn lanes, along with clear zone considerations, require that the lights be placed further away from the intersection than ideal.

At the meeting on August 11, 2015, the City of Newark mentioned that their preferred LED fixture vendor was Leotek, and they shared some fixture samples they had used before. The fixtures samples were tested, but they did not satisfy the desired lighting requirements at any of the study intersections. The Leotek fixture that produced the best results was the GreenCobra LED Street Light, 186W, 4000K CCT, Type 2 Distribution, 700mA Drive Current. This fixture has been shown in the attached figures as **Scenario #1**. After speaking with the City of Newark – City Engineer, Tom Coleman, on June 7th, 2016, it was agreed that the City would use a different manufacturer for the lighting as long as the fixtures were LED. Other LED fixtures were then tested.

Roadway level LED fixtures have been utilized on recent large-scale lighting designs in northern Delaware. One of the fixtures that has been acceptable for these roadway designs is the American Electric Lighting fixture, Autobahn Series – ATB2, 80B Performance, 224W, 4000K CCT, Type 3 Medium Distribution, 850mA Drive Current. Although this fixture produced better results than the fixture used in **Scenario #1**, it still did not meet the lighting requirements at any of the intersections. The attached **Scenario #2** figures show the results for the three intersections utilizing the AE fixture.

The center of the intersections are the areas that are not being lit to a value that is required in order to meet the requirements. The Section 4.2.3 of the DelDOT Lighting Design Guidelines requires that 'Cobrahead luminaires shall be considered standard for use in conventional roadway lighting installations.' Section 4.2.5 requires that a typical luminaire have a medium vertical light distribution, have cutoff optics, and have a lateral light distribution of Type II or III. Use of non-cutoff luminaires are restricted by the state's outdoor lighting law, as noted in the Delaware State Code, Title 7, Chapter 71A. Non-cutoff luminaires are only allowed under certain conditions, especially when cutoff luminaires cannot provide the required lighting level. After running multiple designs with cutoff, medium, Type III fixtures that did not meet the criteria, in order to properly light the intersections a non-cutoff style fixture will be the next fixture tested.

During the meeting on April 7, 2016, it was suggested that a specific mongoose-style fixture that was installed as part of the Dover Toll Plaza improvements could potentially be utilized for this project as well. The Mongoose luminaries are designed to be installed slightly tilted, thereby pushing light further into the roadway with a wider coverage than conventional Cobrahead luminaries. This fixture was a 290W mongoose-style LED fixture from Holophane, with 7 COBs, 4000K CCT, 1050mA Drive Current, Type II Medium Fixture, mounted with an 18-degree tilt angle. The results of the lighting calculations at the intersections utilizing this fixture are shown in the attached **Scenario #3** figures. This fixture did not meet the DelDOT Lighting Design Requirements.

The next fixture tested was another mongoose-style fixture, from General Electric, the 'Evolve LED Area Lighting' Series. This fixture was 322W, and utilized a Type IV asymmetric forward throw, a 4000K CCT, mounted with a 15-degree tilt angle. The attached **Scenario #4** photometric calculations for the three intersections show that this fixture was not able to properly light the Elkton Road/SR 4 intersection nor the Elkton Road/Otts Chapel Road intersection.

To satisfy the DelDOT lighting design criteria, an analysis was performed at the three intersections using an LED floodlight from Eaton (Cooper). This fixture was a Streetworks 'Galleon' series fixture at 445W, a 4000K CCT, and utilized a Type IV forward throw. This floodlight is specified for use on highway projects. Optimum photometric results at the Otts Chapel Road and McIntire Drive intersections would have been achieved by mounting this fixture to utility poles. Unfortunately, after coordinating with the vendor, it was determined that this fixture is not able to be mounted to utility poles. Knowing this, the lighting designs at the intersections of Otts Chapel Road and McIntire Drive had to be slightly modified utilizing fixtures that could actually be installed on the utility poles that were available. Eaton (Cooper) Streetworks 'Navion' series fixtures at 171W, a 4000K CCT, and a Type III distribution was utilized at the south-west corner of the Otts Chapel Intersection and for the McIntire Drive intersection. A lighting design featuring these lights was prepared, as shown in the attached **Scenario #5**. This design met DelDOT recommended lighting levels for the Elkton Road/Otts Chapel Road intersection as well as the Elkton Road/SR 4 intersection.

As was previously stated, DelDOT had given direction for the lighting at the intersection of Elkton Road/McIntire Drive to utilize only utility pole mounted fixtures. When performing the lighting calculations using the 'Navion' fixtures at this intersection, the average maintained illuminance value was below the DelDOT recommended levels due to the utilization of utility poles - which limited the optimal placement of luminaires. The DelDOT recommended average maintained illuminance for the intersection is 1.2 foot-candles, but the proposed luminaires mounted on the utility poles along the roadway will be slightly less with an average maintained illuminance of 1.11 foot-candles. The Illuminance Uniformity Ratio will also slightly exceed the DelDOT recommended levels. Per DelDOT Traffic's email on August 8, 2017, this was determined to be an acceptable lighting design.

Summary

On all the three intersections, AASHTO and DelDOT recommended lighting levels can be obtained by using the luminaries from **Scenario #5**, or have been documented otherwise. These **Scenario #5** fixtures are recommended for use on this project. Due to the wider geometry of the intersections only Type IV lateral light distribution can help to satisfy the recommended lighting levels. The proposed lighting design, using non-cutoff luminaires, is compliant with Delaware State Code, Title 7, § 7102A, based on the exception noted in subsection (c)(6): "A compelling safety interest exists that cannot be addressed by another method."

The intersection of Elkton Road/McIntire Drive will utilize only utility pole lights. The intersection of Elkton Road/Otts Chapel Road required three floodlights and two supplemental utility pole lights to reach the required lighting design criteria. The intersection of Elkton Road/SR 4 will need eight floodlights to meet the requirements.

We recommend using the Eaton LED Galleon floodlight and the Eaton LED Navion light at the necessary intersections on this project. All the supporting lighting analysis materials, as well as the Eaton LED cutsheets, are provided with this memorandum.

Streetworks

DESCRIPTION

The Navion™ roadway LED luminaire combines world class optical performance, energy efficiency, and outstanding versatility to meet the requirements of any roadway application. Patented AccuLED Optics™ technology delivers unparalleled uniformity and budget-beating operating costs for municipal streets and highways. UL/cUL listed for wet locations, IP66 enclosure rating available.

Catalog #		**Type**
Project		
Comments		**Date**
Prepared by		

SPECIFICATION FEATURES

Construction
Heavy-duty cast aluminum housing and door with extruded aluminum heat sink. Tool-less entry, hinged removable power tray door for easy maintenance. 3G vibration rated.

Optics
Choice of 16 patented, high-efficiency AccuLED Optics. The optics are precisely designed to shape the distribution maximizing efficiency and application spacing. AccuLED Optics create consistent distributions with the scalability to meet customized application requirements. Offered standard in 4000K (+/- 275K) CCT and minimum 70 CRI. Optional 3000K, 5000K and 6000K CCT. For the ultimate level of spill light control, an optional house side shield accessory is available and can be field or factory installed. The house side shield is designed to seamlessly integrate with the SL2, SL3, SL4 or AFL optics.

Electrical
LED drivers are mounted to the removable die-cast aluminum door for optimal heat sinking and ease of maintenance. 120-277V 50/60Hz, 347V 60Hz or 480V 60Hz operation. 480V is compatible for use with 480V Wye systems only. 10kV UL 1449 surge protection standard. Thermal management incorporates both conduction and convection to transfer heat rapidly away from the LED source for optimal efficiency and light output. Ambient operating temperature from -40°C to 40°C; 50°C ambient capability available. Standard three-position tunnel type compression terminal block. Greater than 90% lumen maintenance expected at 60,000 hours. Light squares are IP66 enclosure rated. Available in standard 1A drive current and optional 600mA, 800mA and 1200mA drive currents (nominal).

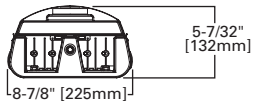
Mounting
Four-bolt/two-bracket slipfitter with cast-in pipe stop and 2.5° leveling steps. Fixed-in-place bird guard seals around 1-1/4" or 2" mounting arms.

Finish
Housing and cast parts finished in five-stage super TGIC polyester powder coat paint, 2.5 mil nominal thickness for superior protection against fade and wear. Heat sink is anodized aluminum. Consult your lighting representative at Eaton for a complete selection of standard colors.

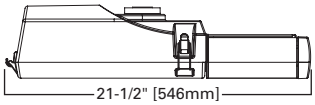
Warranty
Five-year warranty.

DIMENSIONS

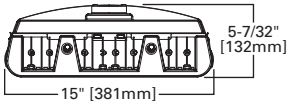
1, 2 or 3 Light Squares



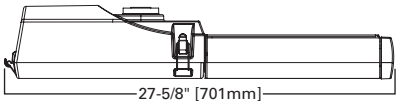
1 Light Square



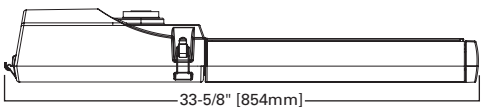
4 or 6 Light Squares



2 or 4 Light Squares



3 or 6 Light Squares



NVN NAVION

1-6 Light Squares

LED

ROADWAY LUMINAIRE

CERTIFICATION DATA
UL/cUL Wet Location Listed
ISO 9001
IP66 Light Squares
3G Vibration Rated
DesignLights Consortium™ Qualified*

ENERGY DATA
Electronic LED Driver
>0.9 Power Factor
<20% Total Harmonic Distortion
120-277V 50/60 Hz,
347V 60 Hz, 480V 60 Hz
-40°C Minimum Temperature
+40°C Ambient Temperature Rating

EPA
Effective Projected Area (Sq. Ft.):
(Fixture Only)
1 Square 0.89
2 Square's 1.0
3 Square's 1.2
4 Square's 1.2
6 Square's 1.4
(Fixture with AI Arm)
1 Square 1.2
2 Square's 1.3
3 Square's 1.5
4 Square's 1.5
6 Square's 1.7

SHIPPING DATA
Approximate Net Weight:
1 Square 17 lbs. (7.7 kgs.)
2 Square's 22 lbs. (10.0 kgs.)
3 Square's 26 lbs. (11.8 kgs.)
4 Square's 31 lbs. (14.1 kgs.)
6 Square's 36 lbs. (16.3 kgs.)

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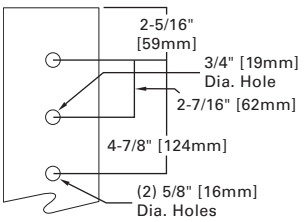
*www.designlights.org

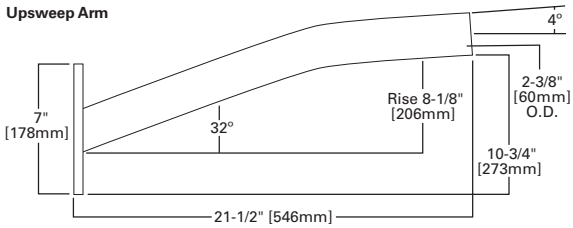
ARM DRILLING

TYPE "M"



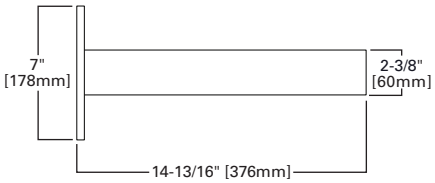
OPTIONAL ARM

Upsweep Arm

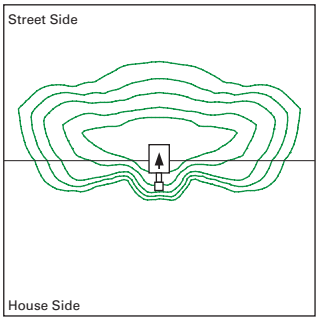


OPTIONAL ARM

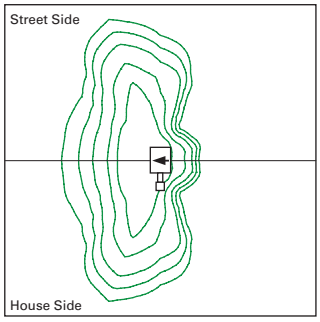
15" Straight Arm



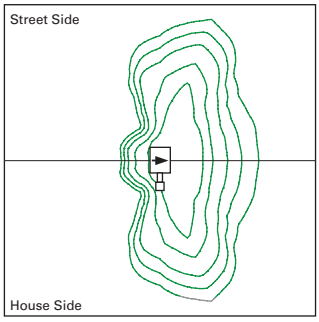
OPTIC ORIENTATION



Standard



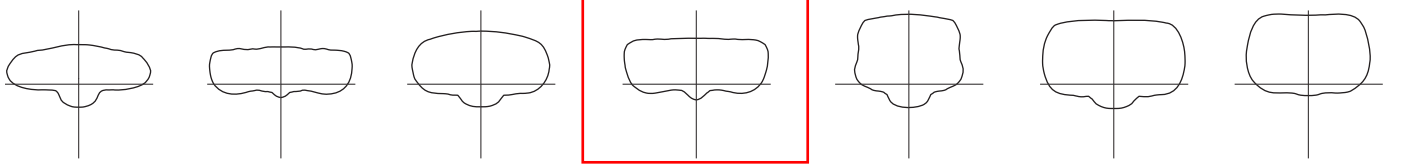
Optics Rotated Left @ 90° (L90)



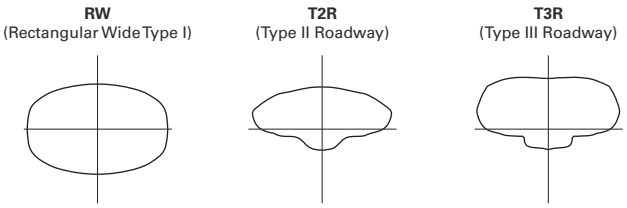
Optics Rotated Right @ 90° (R90)

OPTICAL DISTRIBUTIONS

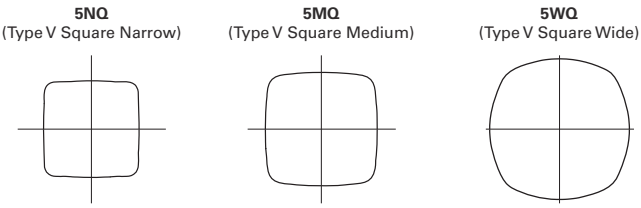
Asymmetric Area Distributions



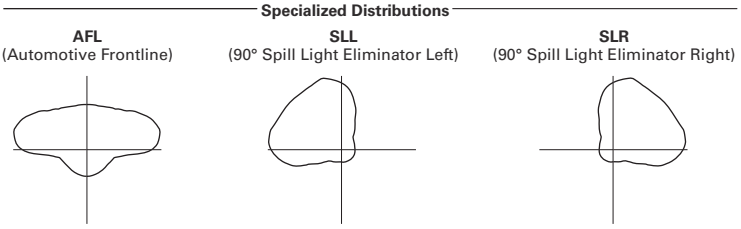
Asymmetric Roadway Distributions



Symmertric Distributions



Specialized Distributions



LUMEN MULTIPLIER

Ambient Temperature	Lumen Multiplier
0°C	1.02
10°C	1.01
25°C	1.00
40°C	0.99
50°C	0.97

LUMEN MAINTENANCE

Drive Current	Ambient Temperature	TM-21Lumen Maintenance (60,000 Hours)	Projected L70 (Hours)
Up to 1A	Up to 50°C	> 95%	416,000
1.2A	Up to 40°C	> 90%	205,000

Powering Business Worldwide

Eaton
1121 Highway 74 South
Peachtree City, GA 30269
P: 770-486-4800
www.eaton.com/lighting

NOMINAL POWER LUMENS (800MA)

Number of Light Squares		1	2	3	4	5	6
Nominal Power (Watts)		44	85	124	171	210	249
Input Current @ 120V (A)		0.39	0.77	1.13	1.54	1.90	2.26
Input Current @ 208V (A)		0.22	0.44	0.62	0.88	1.06	1.24
Input Current @ 240V (A)		0.19	0.38	0.54	0.76	0.92	1.08
Input Current @ 277V (A)		0.17	0.36	0.47	0.72	0.83	0.95
Input Current @ 347V (A)		0.15	0.24	0.38	0.49	0.63	0.77
Input Current @ 480V (A)		0.11	0.18	0.29	0.37	0.48	0.59
Optics							
T2	4000K/5000K Lumens	4,831	9,633	14,325	19,294	23,780	28,487
	3000K Lumens	4,276	8,527	12,680	17,079	21,050	25,217
	BUG Rating	B1-U0-G1	B2-U0-G2	B2-U0-G2	B3-U0-G3	B3-U0-G4	B3-U0-G4
T2R	4000K/5000K Lumens	5,172	10,313	15,337	20,656	25,458	30,499
	3000K Lumens	4,578	9,129	13,576	18,285	22,535	26,998
	BUG Rating	B1-U0-G1	B1-U0-G2	B2-U0-G2	B2-U0-G3	B3-U0-G3	B3-U0-G4
T3	4000K/5000K Lumens	4,937	9,844	14,639	19,717	24,301	29,112
	3000K Lumens	4,370	8,714	12,958	17,453	21,511	25,770
	BUG Rating	B1-U0-G1	B2-U0-G2	B2-U0-G3	B3-U0-G3	B3-U0-G4	B3-U0-G4
T3R	4000K/5000K Lumens	5,021	10,009	14,886	20,049	24,711	29,602
	3000K Lumens	4,445	8,860	13,177	17,747	21,874	26,204
	BUG Rating	B1-U0-G2	B1-U0-G2	B2-U0-G3	B2-U0-G3	B3-U0-G4	B3-U0-G4
T4FT	4000K/5000K Lumens	4,975	9,919	14,751	19,867	24,487	29,334
	3000K Lumens	4,404	8,780	13,058	17,586	21,676	25,966
	BUG Rating	B1-U0-G2	B1-U0-G2	B2-U0-G3	B2-U0-G4	B3-U0-G4	B3-U0-G4
T4W	4000K/5000K Lumens	4,878	9,725	14,462	19,479	24,008	28,759
	3000K Lumens	4,318	8,609	12,802	17,243	21,252	25,457
	BUG Rating	B1-U0-G2	B2-U0-G2	B2-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G4
SL2	4000K/5000K Lumens	4,839	9,648	14,348	19,324	23,817	28,532
	3000K Lumens	4,283	8,540	12,701	17,106	21,083	25,257
	BUG Rating	B1-U0-G2	B2-U0-G2	B2-U0-G3	B3-U0-G3	B3-U0-G4	B3-U0-G4
SL3	4000K/5000K Lumens	4,930	9,829	14,616	19,685	24,263	29,066
	3000K Lumens	4,364	8,701	12,938	17,425	21,478	25,729
	BUG Rating	B1-U0-G2	B1-U0-G2	B2-U0-G3	B2-U0-G3	B3-U0-G4	B3-U0-G4
SL4	4000K/5000K Lumens	4,709	9,388	13,962	18,804	23,176	27,765
	3000K Lumens	4,168	8,310	12,359	16,645	20,515	24,578
	BUG Rating	B1-U0-G2	B1-U0-G3	B1-U0-G3	B2-U0-G4	B2-U0-G4	B2-U0-G5
5NQ	4000K/5000K Lumens	5,074	10,117	15,045	20,263	24,975	29,919
	3000K Lumens	4,492	8,956	13,318	17,937	22,108	26,484
	BUG Rating	B2-U0-G1	B3-U0-G1	B3-U0-G2	B4-U0-G2	B4-U0-G2	B5-U0-G2
5MQ	4000K/5000K Lumens	5,257	10,481	15,586	20,992	25,873	30,995
	3000K Lumens	4,653	9,278	13,797	18,582	22,903	27,437
	BUG Rating	B3-U0-G1	B3-U0-G2	B4-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G3
5WQ	4000K/5000K Lumens	5,135	10,238	15,226	20,507	25,276	30,279
	3000K Lumens	4,546	9,063	13,478	18,153	22,374	26,803
	BUG Rating	B3-U0-G1	B4-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G3	B5-U0-G4
SLL/SLR	4000K/5000K Lumens	4,360	8,692	12,926	17,410	21,457	25,705
	3000K Lumens	3,859	7,694	11,442	15,411	18,994	22,754
	BUG Rating	B1-U0-G2	B1-U0-G3	B2-U0-G3	B2-U0-G3	B3-U0-G4	B3-U0-G4
RW	4000K/5000K Lumens	5,044	10,056	14,955	20,143	24,826	29,740
	3000K Lumens	4,465	8,902	13,238	17,831	21,976	26,326
	BUG Rating	B2-U0-G1	B3-U0-G1	B4-U0-G2	B4-U0-G2	B4-U0-G2	B5-U0-G3
AFL	4000K/5000K Lumens	5,057	10,083	14,995	20,197	24,892	29,820
	3000K Lumens	4,476	8,925	13,274	17,878	22,034	26,397
	BUG Rating	B1-U0-G1	B1-U0-G1	B2-U0-G2	B2-U0-G2	B3-U0-G2	B3-U0-G3

* Nominal data for 70 CRI.

CONTROL OPTIONS

0-10V (DIM)
This fixture is offered standard with 0-10V dimming driver(s). The DIM option provides 0-10V dimming wire leads for use with a lighting control panel or other control method.

Photocontrol (4 and 4N7)
Photocontrol receptacles (4 and 4N7) provide a flexible solution to enable "dusk-to-dawn" lighting by sensing light levels. Advanced control systems compatible with NEMA 7-pin standards can be utilized with the 4N7 receptacle.

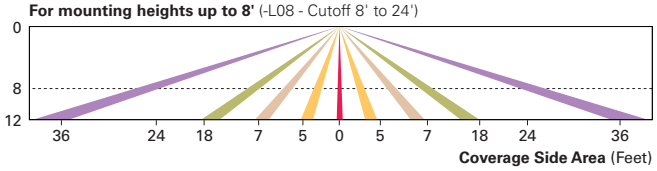
After Hours Dim (AHD)
This feature allows photocontrol-enabled luminaires to achieve additional energy savings by dimming during scheduled portions of the night. The dimming profile will automatically take effect after a "dusk-to-dawn" period has been calculated from the photocontrol input. Specify the desired dimming profile for a simple, factory-shipped dimming solution requiring no external control wiring. Reference the After Hours Dim supplemental guide for additional information.

Dimming Occupancy Sensor (MS/DIM-LXX, MS/X-LXX and MS-LXX)
These sensors are factory installed in the luminaire housing. When the MS/DIM-LXX sensor option is selected, the occupancy sensor is connected to a dimming driver and the entire luminaire dims when there is no activity detected. When activity is detected, the luminaire returns to full light output. The MS/DIM sensor is factory preset to dim down to approximately 50 percent power with a time delay of five minutes. The MS-LXX sensor is factory preset to turn the luminaire off after five minutes of no activity. The MS/X-LXX is also preset for five minutes and only controls the specified number of light engines to maintain steady output from the remaining light engines.

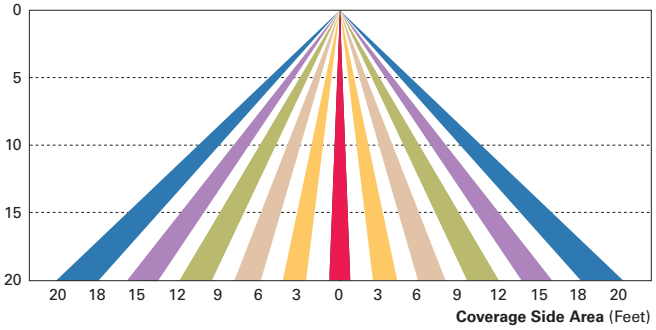
These occupancy sensors includes an integral photocell that can be activated with the FSIR-100 accessory for "dusk-to-dawn" control or daylight harvesting - the factory preset is OFF. The FSIR-100 is a wireless tool utilized for changing the dimming level, time delay, sensitivity and other parameters.

A variety of sensor lens are available to optimize the coverage pattern for mounting heights from 8'-40'.

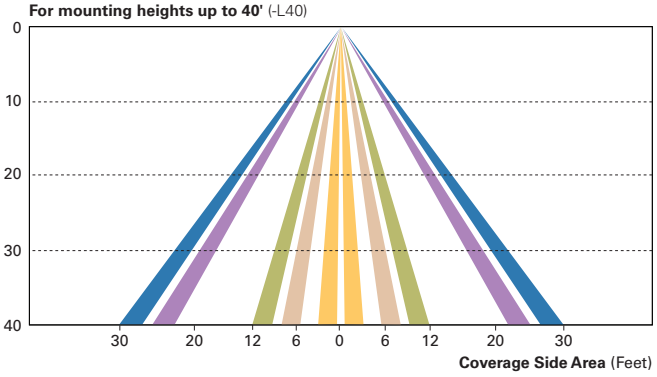
For mounting heights up to 8' (-L08 - Cutoff 8' to 24')



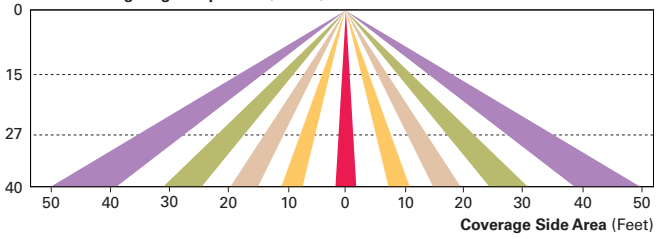
For mounting heights up to 20' (-L20)



For mounting heights up to 40' (-L40)



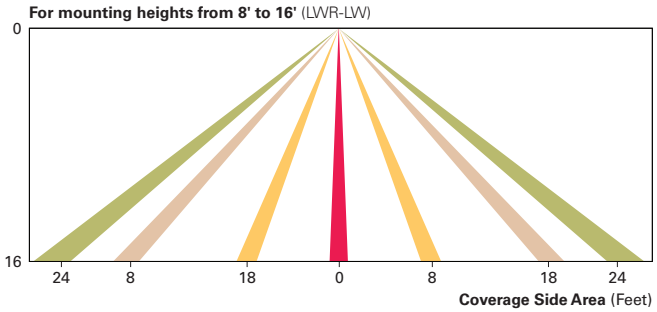
For mounting heights up to 40' (-L40W)



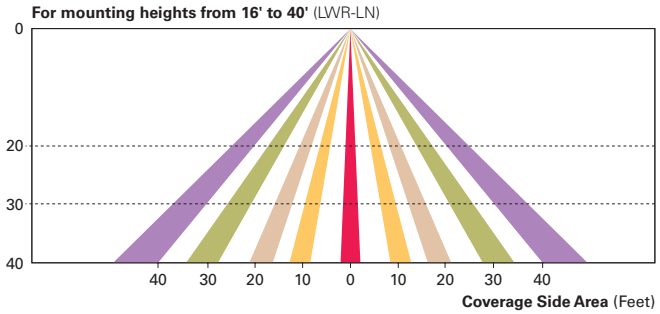
LumaWatt Wireless Control and Monitoring System (LWR-LW and LWR-LN)
The LumaWatt system is a peer-to-peer wireless network of luminaire-integral sensors for any sized project. Each sensor is capable of motion and photo sensing, metering power consumption and wireless communication. The end-user can securely create and manage sensor profiles with browser-based management software. The software will automatically broadcast to the sensors via wireless gateways for zone-based and individual luminaire control. The LumaWatt software provides smart building solutions by utilizing the sensor to provide easy-to-use dashboard and analytic capabilities such as improved energy savings, traffic flow analysis, building management software integration and more.

For additional details, refer to the LumaWatt product guides.

For mounting heights from 8' to 16' (LWR-LW)



For mounting heights from 16' to 40' (LWR-LN)



ORDERING INFORMATION

Sample Number: NVN-AF-01-E-U-T3R-10K-4-AP

Product Family [1, 2]	Light Engine	Number of Light Squares [3]	Driver	Voltage	Distribution	Surge Protection
NVN=Navion	**AF**	**01**=1 **02**=2 **03**=3 **04**=4 **06**=6	**E**=Non-Dimming **D**=Dimming (0-10V) [4]	**U**=Universal (120-277V) **8**=480V [5] **9**=347V [6]	**T2**=Type II **T2R**=Type II Roadway **T3**=Type III **T3R**=Type III Roadway **T4FT**=Type IV Forward Throw **T4W**=Type IV Wide **5NQ**=Type V Narrow **5MQ**=Type V Square Medium **5WQ**=Type V Square Wide **SL2**=Type II w/Spill Control **SL3**=Type III w/Spill Control **SL4**=Type IV w/Spill Control **SLL**=90° Spill Light Eliminator Left **SLR**=90° Spill Light Eliminator Right **RW**=Rectangular Wide Type I **AFL**=Automotive Frontline	**10K**=Cooper 10kV Surge Module (Standard) **X**=Driver Surge Protection Only [7]

Options (Add as Suffix)

2L=Two Circuits [8]
7030=70 CRI / 3000K [9]
7050=70 CRI / 5000K [9]
7060=70 CRI / 6000K [9]
8030=80 CRI / 3000K [9]
600=Drive Current Factory Set to 615mA [10, 11]
800=Drive Current Factory Set to 800mA [10, 11]
1200=Drive Current Set to 1.2mA
4=NEMA Twistlock Photocontrol Receptacle
4N7=NEMA 7-PIN Twistlock Photocontrol Receptacle [12]
IP66=IP66 Rated
HA=50°C High Ambient [13]
L90=Optics Rotated 90° Left
R90=Optics Rotated 90° Right
CE=CE Marking [14]

MS/DIM-L08=Motion Sensor for Dimming Operation, Maximum 8' Mounting Height [15]
MS/DIM-L20=Motion Sensor for Dimming Operation, 9' - 20' Mounting Height [15]
MS/DIM-L40=Motion Sensor for Dimming Operation, 21' - 40' Mounting Height [15]
MS/X-L08=Bi-Level Motion Sensor, Maximum 8' Mounting Height [16]
MS/X-L20=Bi-Level Motion Sensor, 9' - 20' Mounting Height [16]
MS/X-L40=Bi-Level Motion Sensor, 21' - 40' Mounting Height [16]
K=Level Indicator
AI=Site Arm Included [17]
A15=Arm Included (15" Straight Arm) [18]
LCF=Light Square Trim Plate Painted to Match Housing
HSS=Factory Installed House Side Shield [19]
DIMRF-LW=LumaWatt Wireless Sensor, Wide Lens for 8' - 16' Mounting Heights [20, 21]
DIMRF-LN=LumaWatt Wireless Sensor, Narrow Lens for 16' - 40' Mounting Heights [20, 21]
AHD145=After Hours Dim, 5 Hours [22]
AHD245=After Hours Dim, 6 Hours [22]
AHD255=After Hours Dim, 7 Hours [22]
AHD355=After Hours Dim, 8 Hours [22]

Color

AP=Grey (Standard)
BZ=Bronze
BK=Black
DP=Dark Platinum
GM=Graphite Metallic
WH=White

Accessories (Order Separately)

OA/RA1016=NEMA Photocontrol - Multi-Tap
OA/RA1027=NEMA Photocontrol - 480V
OA/RA1201=NEMA Photocontrol - 347V
OA/RA1013=Photocontrol Shorting Cap
OA/RA1014=NEMA Photo Control - 120V
OA1223=10kV Surge Module Replacement
FSIR-100=Wireless Configuration Tool for Motion Sensor [23]
LS/HSS=Field Installed House Side Shield [24]
A15=15" Straight Arm [17]

NOTES:

1. DesignLights Consortium™ Qualified and classified for both DLC Standard and DLC Premium, refer to www.designlights.org for details.
2. Customer is responsible for engineering analysis to confirm pole and fixture compatibility for all applications. Refer to our white paper WP513001EN for additional support information.
3. Standard 1A drive current. Standard 4000K CCT and nominal 70 CRI.
4. Must specify 4N7 option.
5. Only for use with 480V Wye systems. Per NEC, not for use with ungrounded systems, impedance grounded systems or corner grounded systems (commonly known as Three Phase Three Wire Delta, Three Phase High Leg Delta and Three Phase Corner Grounded Delta systems).
6. Requires the use of an internal step down transformer when combined with sensor options. Not available with sensor at 1200mA. Not available in combination with the HA high ambient and sensor options at 1A.
7. Consult factory for driver surge protection values.
8. Low-level output varies by number of light squares specified. Consult factory. Requires two or more light squares. No terminal block with 2L options.
9. Use dedicated IES files for 3000K, 5000K and 6000K when performing layouts. These files are published on the Navion luminaire product page on the website. Extended lead times apply.
10. 1 Amp standard. Use dedicated IES files for 600mA, 800mA and 1200mA when performing layouts. These files are published on the Navion luminaire product page on the website.
11. Not available with any MS/DIM or DIMRF options.
12. Only available with dimming driver.
13. Not available with 1200mA.
14. CE is not available with the 1200mA, DIMRF, MS, MS/X, MS/DIM, 4 or 4N7 options. Available in 120-277V only.
15. Sensor mounted externally. Must specify dimming driver. Consult factory for more information.
16. Sensor mounted externally. Available in 2, 3, 4 or 6 Light Square configurations. Replace "X" with number of Light Squares in low output mode. For ON/OFF operation, replace "X" with "0". Maximum two Light Squares in low output mode. Not available with dimming driver. No terminal block with bi-level operation.
17. 22" upsweep arm. Round pole adapter included.
18. Round pole adapter and mounting hardware inlcued, "M" drilling pattern.
19. Only for use with SL2, SL3, SL4 and AFL distributions. The Light Square trim plate is painted black when the HSS option is selected.
20. LumaWatt wireless sensors are factory installed and require network components RF-EM-1, RF-GW-1 and RF-ROUT-1 in appropriate quantities. See www.eaton.com/lighting for LumaWatt application information.
21. LumaWatt wireless system is not available with 4N7 (Not needed) or with 600mA, 800mA or 2L options.
22. Requires the use of 4 or 4N7 photocontrol receptacle with photocontrol accessory. See After Hours Dim supplemental guide for additional information.
23. This tool enables adjustment of parameters including high and low modes, sensitivity, time delay, cutoff and more. Consult your lighting representative at Eaton for more information.
24. One required for each light square.

Streetworks

DESCRIPTION

The Galleon™ LED Flood luminaire combines the low-profile design of the Galleon with the mounting angle flexibility of a pole-mounted floodlight. With a maximum tilt angle of 60° from horizontal, and patented, high-efficiency AccuLED Optics™ technology, it provides uniform and energy conscious illumination for parking lots, container/rail yards and highway projects. Mounts direct to pole or to a bullhorn or pole-top tenon. IP66 rated and UL/cUL Listed for wet locations.

Catalog #		**Type**
Project		
Comments		**Date**
Prepared by		

SPECIFICATION FEATURES

Construction
Extruded aluminum driver enclosure thermally isolated from Light Squares for optimal thermal performance. Heavy-wall, die-cast aluminum end caps enclose housing and die-cast aluminum heat sinks. A unique, patent pending interlocking housing and heat sink provides scalability with superior structural rigidity. 3G vibration and IP66 rated up to 60° from horizontal. Optional tool-less hardware available for ease of entry into electrical chamber.

Optics
Patented, high-efficiency injection-molded AccuLED Optics technology. Optics are precisely designed to shape the distribution maximizing efficiency and application spacing. AccuLED Optics create consistent distributions with the scalability to meet customized application requirements. Offered standard in 4000K (+/- 275K) CCT 70 CRI. Optional 6000K CCT, 5000K CCT and 3000K CCT.

Electrical
LED drivers are mounted to removable tray assembly for ease of maintenance.120-277V 50/60Hz, 347V 60Hz or 480V 60Hz operation. 480V is compatible for use with 480V Wye systems only. Standard with 0-10V dimming. Shipped standard with our proprietary circuit module designed to withstand 10kV of transient line surge. The Galleon LED Flood luminaire is suitable for operation in -40°C to 40°C ambient environments. For applications with ambient temperatures exceeding 40°C, specify the HA (High Ambient) option. Light Squares are IP66 rated. 90% lumen maintenance expected at 60,000 hours. Available in standard 1A drive current and optional 600mA, 800mA and 1200mA drive currents (nominal).

Mounting
Cast aluminum knuckle arm mounts directly to fixture housing, and is available with either commercial pole mount or slipfitter for bullhorn, pipe or tenon mount. Can be tilted up to 60° from horizontal without compromising vibration or IP rating.

Finish
Housing finished in super durable TGIC polyester powder coat paint, 2.5 mil nominal thickness for superior protection against fade and wear. Heat sink is powder coated black. Standard housing colors include black, bronze, grey, white, dark platinum and graphite metallic. RAL and custom color matches available.

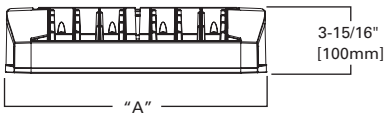
Warranty
Five-year warranty.

GAN GALLEON LED FLOOD

1-10 Light Squares
Solid State LED

FLOODLIGHT LUMINAIRE

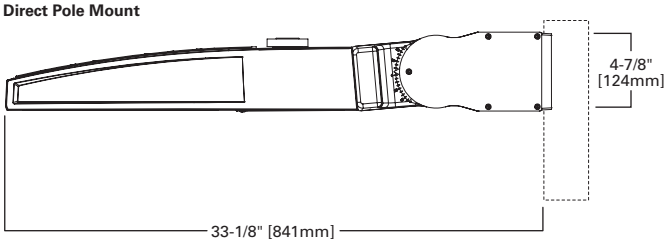
DIMENSIONS



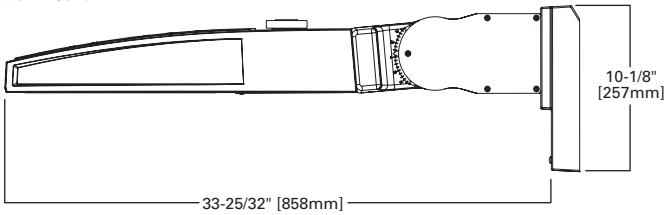
DIMENSIONAL DATA

Number of Light Squares	"A" Width
1-4	15-1/2" (394mm)
5-6	21-5/8" (549mm)
7-8	27-5/8" (702mm)
9-10	33-3/4" (857mm)

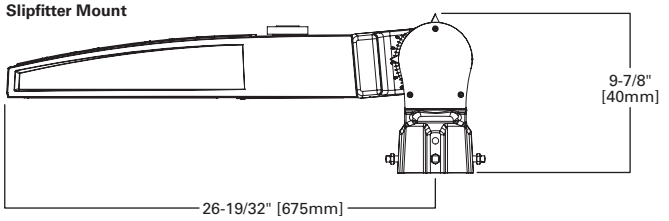
Direct Pole Mount



Wall Mount

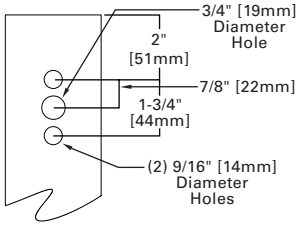


Slipfitter Mount



DRILLING PATTERN

TYPE "N"



CERTIFICATION DATA

UL/cUL Wet Location Listed
ISO 9001
LM79 / LM80 Compliant
3G Vibration Rated up to 60° from Horizontal
IP66 Rated up to 60° from Horizontal

ENERGY DATA

Electronic LED Driver
>0.9 Power Factor
<20% Total Harmonic Distortion
120V-277V 50/60Hz
347V & 480V 60Hz
-40°C Min. Temperature
40°C Max. Temperature
50°C Max. Temperature (HA Option)

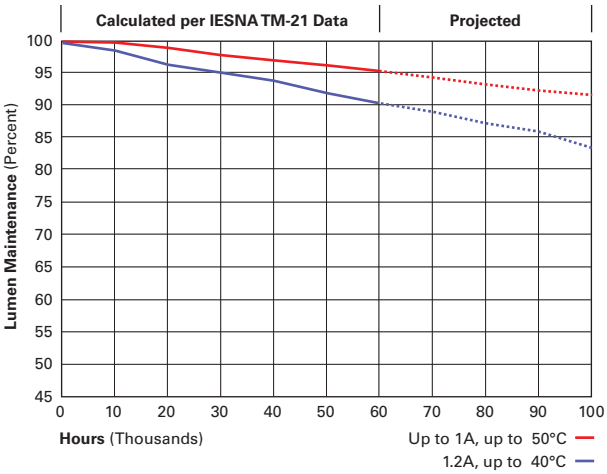
Powering Business Worldwide

EPA CHART

Title Angle (Degrees)	Number of Light Squares	Weight	1 @ 90°	2 @ 180°	2 @ 90°	2 @ 120°	3 @ 90°	3 @ 120°	4 @ 90°
0°	1-4	34 lbs. (15.45 kgs.)	1.21	2.42	1.94	2.19	2.92	2.83	3.87
	5-6	45 lbs. (20.45 kgs.)	1.21	2.42	2.12	2.28	3.12	3.12	4.23
	7-8	55 lbs. (25.00 kgs.)	1.21	2.42	2.32	2.39	3.31	3.42	4.65
	9-10	63 lbs. (28.63 kgs.)	1.21	2.42	2.55	2.51	3.51	3.73	5.11
15°	1-4	34 lbs. (15.45 kgs.)	1.21	2.42	2.14	2.39	3.14	3.16	4.23
	5-6	45 lbs. (20.45 kgs.)	1.21	2.42	2.46	2.46	3.43	3.60	4.91
	7-8	55 lbs. (25.00 kgs.)	1.30	2.59	2.80	2.65	3.80	4.06	5.59
	9-10	63 lbs. (28.63 kgs.)	1.58	3.17	3.16	3.02	4.38	4.54	6.32
30°	1-4	34 lbs. (15.45 kgs.)	1.41	2.82	2.94	2.78	4.05	4.25	5.88
	5-6	45 lbs. (20.45 kgs.)	1.96	3.92	3.66	3.55	5.13	5.18	7.31
	7-8	55 lbs. (25.00 kgs.)	2.51	5.01	4.39	4.33	6.22	6.16	8.78
	9-10	63 lbs. (28.63 kgs.)	3.06	6.12	5.15	5.14	7.33	7.23	10.30
45°	1-4	34 lbs. (15.45 kgs.)	1.99	2.99	3.70	3.60	5.19	5.23	7.40
	5-6	45 lbs. (20.45 kgs.)	2.77	5.55	4.76	4.72	6.76	6.67	9.81
	7-8	55 lbs. (25.00 kgs.)	3.54	7.09	5.82	5.85	8.29	8.16	11.64
	9-10	63 lbs. (28.63 kgs.)	4.33	8.66	6.91	7.01	9.87	9.70	13.82
60°	1-4	34 lbs. (15.45 kgs.)	2.44	4.88	4.30	4.24	6.09	6.04	8.60
	5-6	45 lbs. (20.45 kgs.)	3.40	6.79	5.62	5.64	8.00	7.88	11.26
	7-8	55 lbs. (25.00 kgs.)	4.34	8.68	6.93	7.03	9.89	9.72	13.85
	9-10	63 lbs. (28.63 kgs.)	5.30	10.60	8.27	8.46	11.81	11.61	16.55

LUMEN MAINTENANCE

Drive Current	Ambient Temperature	TM-21 Lumen Maintenance (60,000 Hours)	Projected L70 (Hours)
Up to 1A	Up to 50°C	> 95%	416,000
1.2A	Up to 40°C	> 90%	205,000



LUMEN MULTIPLIER

Ambient Temperature	Lumen Multiplier
0°C	1.02
10°C	1.01
25°C	1.00
40°C	0.99
50°C	0.97

NOMINAL POWER LUMENS (1A)

Number of Light Squares		1	2	3	4	5	6	7	8	9	10
Nominal Power (Watts)		59	113	166	225	279	333	391	445	501	558
Input Current @ 120V (A)		0.51	1.02	1.53	2.03	2.55	3.06	3.56	4.08	4.6	5.07
Input Current @ 208V (A)		0.29	0.56	0.82	1.11	1.37	1.64	1.93	2.19	2.46	2.75
Input Current @ 240V (A)		0.26	0.48	0.71	0.96	1.19	1.41	1.67	1.89	2.12	2.39
Input Current @ 277V (A)		0.23	0.42	0.61	0.83	1.03	1.23	1.45	1.65	1.84	2.09
Input Current @ 347V (A)		0.17	0.32	0.50	0.64	0.82	1.00	1.14	1.32	1.50	1.68
Input Current @ 480V (A)		0.14	0.24	0.37	0.48	0.61	0.75	0.91	0.99	1.12	1.28
Optics											
T2	4000K/5000K Lumens	6,116	11,951	17,833	23,563	29,195	34,937	41,317	46,814	52,221	57,817
	3000K Lumens	5,414	10,579	15,786	20,858	25,843	30,926	36,574	41,440	46,226	51,180
T2R	4000K/5000K Lumens	6,493	12,688	18,932	25,015	30,994	37,090	43,863	49,699	55,439	61,380
	3000K Lumens	5,748	11,231	16,759	22,143	27,436	32,832	38,828	43,994	49,075	54,334
T3	4000K/5000K Lumens	6,234	12,181	18,176	24,017	29,756	35,609	42,111	47,715	53,225	58,930
	3000K Lumens	5,518	10,783	16,089	21,260	26,340	31,521	37,277	42,237	47,115	52,165
T3R	4000K/5000K Lumens	6,372	12,453	18,580	24,550	30,418	36,400	43,048	48,776	54,409	60,239
	3000K Lumens	5,640	11,023	16,447	21,732	26,926	32,221	38,106	43,177	48,163	53,324
T4FT	4000K/5000K Lumens	6,270	12,252	18,282	24,156	29,929	35,815	42,356	47,992	53,534	59,271
	3000K Lumens	5,550	10,845	16,183	21,383	26,493	31,703	37,494	42,483	47,388	52,467
T4W	4000K/5000K Lumens	6,189	12,094	18,045	23,844	29,543	35,352	41,809	47,372	52,843	58,506
	3000K Lumens	5,479	10,706	15,973	21,107	26,151	31,294	37,009	41,934	46,777	51,790
SL2	4000K/5000K Lumens	6,105	11,931	17,803	23,522	29,144	34,877	41,245	46,734	52,130	57,717
	3000K Lumens	5,404	10,561	15,759	20,822	25,798	30,873	36,510	41,369	46,145	51,091
SL3	4000K/5000K Lumens	6,233	12,180	18,174	24,013	29,753	35,604	42,106	47,708	53,218	58,921
	3000K Lumens	5,517	10,782	16,088	21,256	26,337	31,517	37,272	42,231	47,109	52,157
SL4	4000K/5000K Lumens	5,922	11,572	17,268	22,816	28,269	33,829	40,006	45,330	50,566	55,984
	3000K Lumens	5,242	10,244	15,286	20,197	25,024	29,945	35,413	40,126	44,761	49,557
5NQ	4000K/5000K Lumens	6,429	12,563	18,746	24,768	30,688	36,723	43,429	49,208	54,891	60,775
	3000K Lumens	5,691	11,121	16,594	21,925	27,165	32,507	38,443	43,559	48,590	53,798
5MQ	4000K/5000K Lumens	6,547	12,794	19,090	25,224	31,253	37,400	44,228	50,114	55,902	61,893
	3000K Lumens	5,795	11,325	16,898	22,328	27,665	33,106	39,151	44,361	49,484	54,788
5WQ	4000K/5000K Lumens	6,564	12,828	19,141	25,291	31,336	37,499	44,347	50,248	56,051	62,058
	3000K Lumens	5,810	11,355	16,944	22,388	27,739	33,194	39,256	44,480	49,616	54,934
SLL/SLR	4000K/5000K Lumens	5,478	10,703	15,970	21,102	26,145	31,286	37,001	41,924	46,765	51,777
	3000K Lumens	4,849	9,474	14,137	18,679	23,144	27,694	32,753	37,111	41,396	45,833
RW	4000K/5000K Lumens	6,371	12,449	18,576	24,544	30,411	36,392	43,037	48,764	54,396	60,225
	3000K Lumens	5,640	11,020	16,443	21,726	26,920	32,214	38,096	43,166	48,151	53,311
AFL	4000K/5000K Lumens	6,394	12,494	18,644	24,634	30,521	36,524	43,194	48,942	54,593	60,444
	3000K Lumens	5,660	11,060	16,504	21,806	27,017	32,331	38,235	43,323	48,326	53,505

* Nominal data for 70 CRI.

CONTROL OPTIONS

0-10V (DIM)
This fixture is offered standard with 0-10V dimming driver(s). The DIM option provides 0-10V dimming wire leads for use with a lighting control panel or other control method.

Photocontrol (P, 4 and 4N7)
Optional button-type photocontrol (P) and photocontrol receptacles (4 and 4N7) provide a flexible solution to enable "dusk-to-dawn" lighting by sensing light levels. Advanced control systems compatible with NEMA 7-pin standards can be utilized with the 4N7 receptacle.

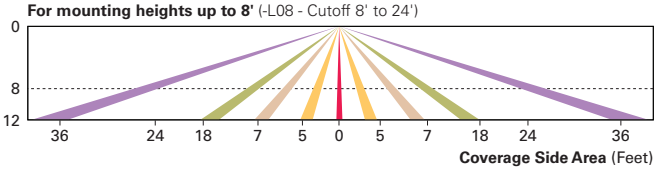
After Hours Dim (AHD)
This feature allows photocontrol-enabled luminaires to achieve additional energy savings by dimming during scheduled portions of the night. The dimming profile will automatically take effect after a "dusk-to-dawn" period has been calculated from the photocontrol input. Specify the desired dimming profile for a simple, factory-shipped dimming solution requiring no external control wiring. Reference the After Hours Dim supplemental guide for additional information.

Dimming Occupancy Sensor (MS/DIM-LXX, MS/X-LXX and MS-LXX)
These sensors are factory installed in the luminaire housing. When the MS/DIM-LXX sensor option is selected, the occupancy sensor is connected to a dimming driver and the entire luminaire dims when there is no activity detected. When activity is detected, the luminaire returns to full light output. The MS/DIM sensor is factory preset to dim down to approximately 50 percent power with a time delay of five minutes. The MS-LXX sensor is factory preset to turn the luminaire off after five minutes of no activity. The MS/X-LXX is also preset for five minutes and only controls the specified number of light engines to maintain steady output from the remaining light engines.

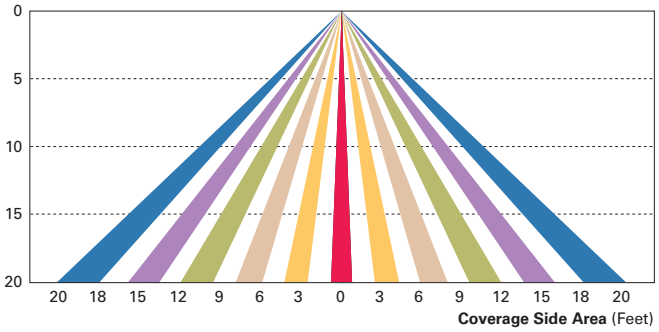
These occupancy sensors includes an integral photocell that can be activated with the FSIR-100 accessory for "dusk-to-dawn" control or daylight harvesting - the factory preset is OFF. The FSIR-100 is a wireless tool utilized for changing the dimming level, time delay, sensitivity and other parameters.

A variety of sensor lens are available to optimize the coverage pattern for mounting heights from 8'-40'.

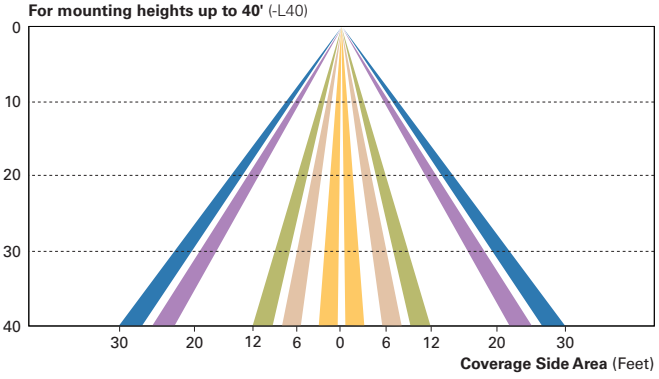
For mounting heights up to 8' (-L08 - Cutoff 8' to 24')



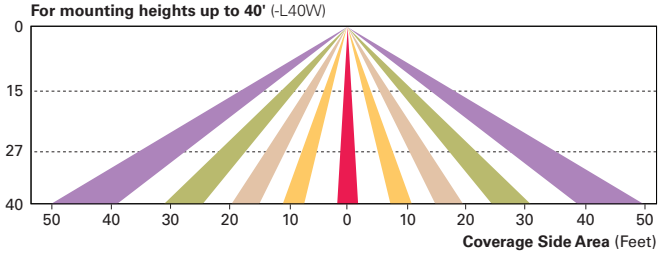
For mounting heights up to 20' (-L20)



For mounting heights up to 40' (-L40)



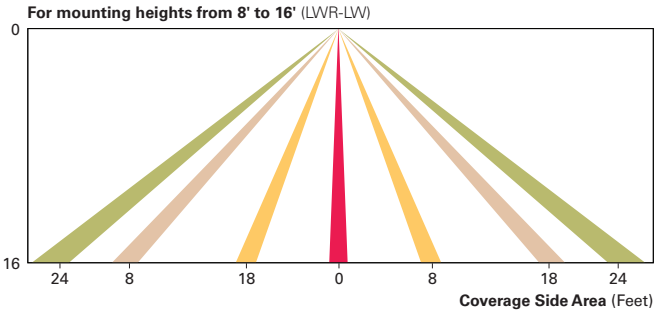
For mounting heights up to 40' (-L40W)



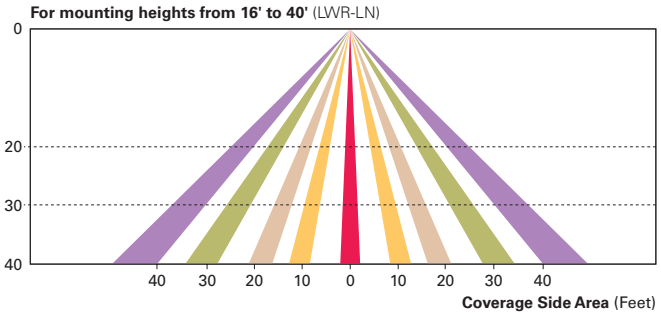
LumaWatt Wireless Control and Monitoring System (LWR-LW and LWR-LN)
The LumaWatt system is a peer-to-peer wireless network of luminaire-integral sensors for any sized project. Each sensor is capable of motion and photo sensing, metering power consumption and wireless communication. The end-user can securely create and manage sensor profiles with browser-based management software. The software will automatically broadcast to the sensors via wireless gateways for zone-based and individual luminaire control. The LumaWatt software provides smart building solutions by utilizing the sensor to provide easy-to-use dashboard and analytic capabilities such as improved energy savings, traffic flow analysis, building management software integration and more.

For additional details, refer to the LumaWatt product guides.

For mounting heights from 8' to 16' (LWR-LW)



For mounting heights from 16' to 40' (LWR-LN)



ORDERING INFORMATION

Sample Number: GAN-AF-04-LED-U-T4FT-AP-ADJS

Product Family	Light Engine	Number of Light Squares [1]	Lamp Type	Voltage	Distribution	Color	Mounting
GAN=Galleon	**AF**=1A Drive Current	**01**=1 **02**=2 **03**=3 **04**=4 **06**=6 **07**=7 **08**=8 **09**=9 **10**=10	**LED**=Solid State Light Emitting Diodes	**U**=Universal (120-277V) ~~**8**=480V [2, 3]~~ **9**=347V [2]	**T2**=Type II **T2R**=Type II Roadway **T3**=Type III **T3R**=Type III Roadway **T4FT**=Type IV Forward Throw ~~**T4W**=Type IV Wide~~ **5NQ**=Type V Narrow **5MQ**=Type V Square Medium **5WQ**=Type V Square Wide **SL2**=Type II w/Spill Control **SL3**=Type III w/Spill Control **SL4**=Type IV w/Spill Control **SLL**=90° Spill Light Eliminator Left **SLR**=90° Spill Light Eliminator Right **RW**=Rectangular Wide Type I **AFL**=Automotive Frontline	**AP**=Grey **BZ**=Bronze **BK**=Black **DP**=Dark Platinum **GM**=Graphite Metallic **WH**=White	**ADJA**=Adjustable Arm - Direct Pole Mount [4] **ADJS**=Adjustable Arm - Slipfitter [4] **ADJA-WM**=Adjustable Arm - Direct Pole Mount and Wall Mount Adapter [4]

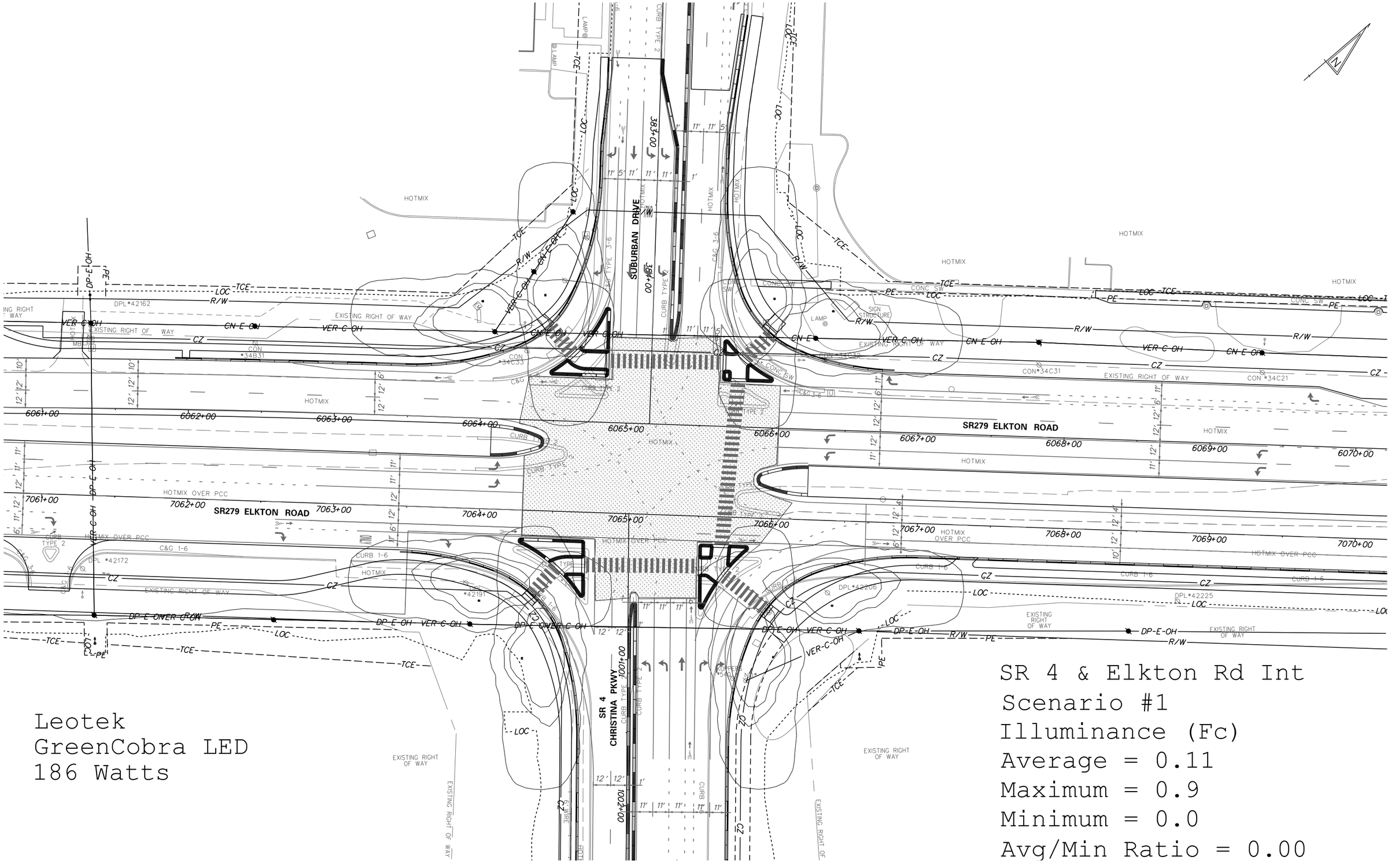
Options (Add as Suffix)

2L=Two Circuits [5, 6]
7030=70 CRI 3000K [7]
8030=80 CRI 3000K [7]
7050=70 CRI 5000K [7]
7060=70 CRI 6000K [7]
600=Drive Current Factory Set to 600mA [8]
800=Drive Current Factory Set to 800mA [8]
1200=Drive Current Factory Set to 1200mA [8, 9]
DIM=External 0-10V Dimming Leads
3=Three-Position Terminal Block
P=Button Type Photocontrol (120, 208, 240 or 277V. Must Specify Voltage)
4=NEMA Twistlock Photocontrol Receptacle
4N7=NEMA 7-PIN Twistlock Photocontrol Receptacle
AHD145=After Hours Dim, 5 Hours [10]
AHD245=After Hours Dim, 6 Hours [10]
AHD255=After Hours Dim, 7 Hours [10]
AHD355=After Hours Dim, 8 Hours [10]
HA=50°C High Ambient [11]
MS/DIM-L08=Motion Sensor for Dimming Operation, Maximum 8' Mounting Height [12, 13, 14]
MS/DIM-L20=Motion Sensor for Dimming Operation, 9' - 20' Mounting Height [12, 13, 15]
MS/DIM-L40=Motion Sensor for Dimming Operation, 21' - 40' Mounting Height [12, 13, 16]
MS/DIM-L40W=Motion Sensor for Dimming Operation, 21' - 40' Mounting Height (Wide Range) [12, 13, 17]
MS/X-L08=Bi-Level Motion Sensor, Maximum 8' Mounting Height [12, 13, 14]
MS/X-L20=Bi-Level Motion Sensor, 9' - 20' Mounting Height [12, 13, 15]
MS/X-L40=Bi-Level Motion Sensor, 21' - 40' Mounting Height [12, 13, 16, 18]
MS/X-L40W=Bi-Level Motion Sensor, 21' - 40' Mounting Height (Wide Range) [12, 13, 17, 18]
MS-L08=Motion Sensor for ON/OFF Operation, Maximum 8' Mounting Height [11, 12, 13, 14, 15]
MS-L20=Motion Sensor for ON/OFF Operation, 9' - 20' Mounting Height [12, 13, 14]
MS-L40=Motion Sensor for ON/OFF Operation, 21' - 40' Mounting Height [12, 13, 16]
MS-L40W=Motion Sensor for ON/OFF Operation, 21' - 40' Mounting Height (Wide Range) [12, 13, 17]
LWR-LW=LumaWatt Wireless Sensor, Wide Lens for 8' - 16' Mounting Height [12, 19]
LWR-LN=LumaWatt Wireless Sensor, Narrow Lens for 16' - 40' Mounting Height [12, 19]
MT=Factory Installed Mesh Top
TH=Tool-less Door Hardware
LCF=Light Square Trim Plate Painted to Match Housing [20]
HSS=Factory Installed House Side Shield [21]

Accessories (Order Separately)

OA/RA1016=NEMA Photocontrol Multi-Tap - 105-285V
OA/RA1027=NEMA Photocontrol - 480V
OA/RA1201=NEMA Photocontrol - 347V
OA/RA1013=Photocontrol Shorting Cap
OA/RA1014=120V Photocontrol
SA1252=10kV Surge Module Replacement
SA1036-XX=Single Tenon Adapter for 2-3/8" O.D. Tenon
SA1037-XX=2@180° Tenon Adapter for 2-3/8" O.D. Tenon
SA1197-XX=3@120° Tenon Adapter for 2-3/8" O.D. Tenon
SA1188-XX=4@90° Tenon Adapter for 2-3/8" O.D. Tenon
SA1189-XX=2@90° Tenon Adapter for 2-3/8" O.D. Tenon
SA1190-XX=3@90° Tenon Adapter for 2-3/8" O.D. Tenon
SA1191-XX=2@120° Tenon Adapter for 2-3/8" O.D. Tenon
SA1038-XX=Single Tenon Adapter for 3-1/2" O.D. Tenon
SA1039-XX=2@180° Tenon Adapter for 3-1/2" O.D. Tenon
SA1192-XX=3@120° Tenon Adapter for 3-1/2" O.D. Tenon
SA1193-XX=4@90° Tenon Adapter for 3-1/2" O.D. Tenon
SA1194-XX=2@90° Tenon Adapter for 3-1/2" O.D. Tenon
SA1195-XX=3@90° Tenon Adapter for 3-1/2" O.D. Tenon
FSIR-100=Wireless Configuration Tool for Occupancy Sensor [13]
GAN-MT1=Field Installed Mesh Top for 1-4 Light Squares
GAN-MT2=Field Installed Mesh Top for 5-6 Light Squares
GAN-MT3=Field Installed Mesh Top for 7-8 Light Squares
GAN-MT4=Field Installed Mesh Top for 9-10 Light Squares
LS/HSS=Field Installed House Side Shield [21, 22]

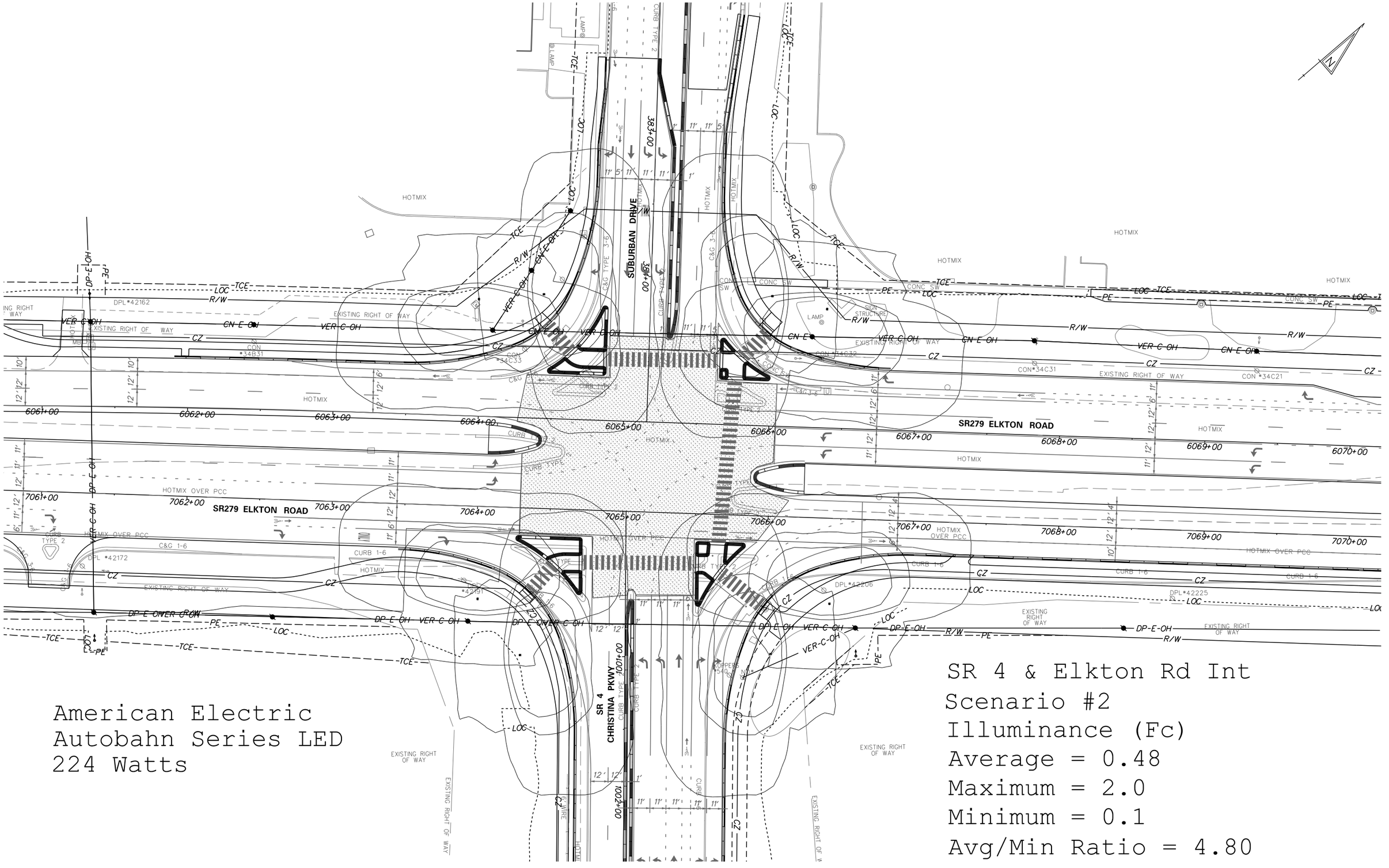
NOTES:
1. Standard 4000K CCT and minimum 70 CRI.
2. Requires the use of a step down transformer when combined with MS/DIM, MS/X or LWR. Not available with sensor at 1200mA. Not available in combination with the HA high ambient and sensor options at 1A.
3. Only for use with 480V Wye systems. Per NEC, not for use with ungrounded systems, impedance grounded systems or corner grounded systems (commonly known as Three Phase Three Wire Delta, Three Phase High Leg Delta and Three Phase Corner Grounded Delta systems).
4. Not intended for title angles greater than 60° from horizontal.
5. 2L is not available with MS, MS/X or MS/DIM at 347V or 480V. 2L in AF-02 through AF-04 requires a larger housing, normally used for AF-05 or AF-06.
6. Not available with LumaWatt wireless sensors.
7. Extended lead times apply. Use dedicated IES files for 3000K, 4000K, 5000K and 6000K when performing layouts. These files are published on the Galleon LED Flood luminaire product page on the website.
8. 1 Amp standard. Use dedicated IES files for 600mA 800mA and 1200mA when performing layouts. These files are published on the Galleon LED Flood luminaire product page on the website.
9. Not available with HA option.
10. Requires the use of P photocontrol or the 4N7 photocontrol receptacle with photocontrol accessory. See After Hours Dim supplemental guide for additional information.
11. 50°C lumen maintenance applies to 600mA, 800mA and 1A drive currents.
12. Not recommended for applications when the luminaire is tilted more than 10° from horizontal. Consult your lighting representative at Eaton for more information.
13. The FSIR-100 configuration tool is required to adjust parameters including high and low modes, sensitivity, time delay, cutoff and more. Consult your lighting representative at Eaton for more information.
14. Approximately 22' detection diameter at 8' mounting height.
15. Approximately 40' detection diameter at 20' mounting height.
16. Approximately 60' detection diameter at 40' mounting height.
17. Approximately 100' detection diameter at 40' mounting height.
18. Replace X with number of Light Squares operating in low output mode.
19. LumaWatt wireless sensors are factory installed, requiring network components RF-EM-1, RF-GW-1 and RF-ROUT-1 in appropriate quantities. See www.eaton.com/lighting for LumaWatt application information.
20. Not available with house side shield (HSS).
21. Only for use with SL2, SL3, SL4 and AFL distributions. The Light Square trim plate is painted black when the HSS option is selected
22. One required for each Light Square.



Leotek
GreenCobra LED
186 Watts

SR 4 & Elkton Rd Int
Scenario #1
Illuminance (Fc)
Average = 0.11
Maximum = 0.9
Minimum = 0.0
Avg/Min Ratio = 0.00

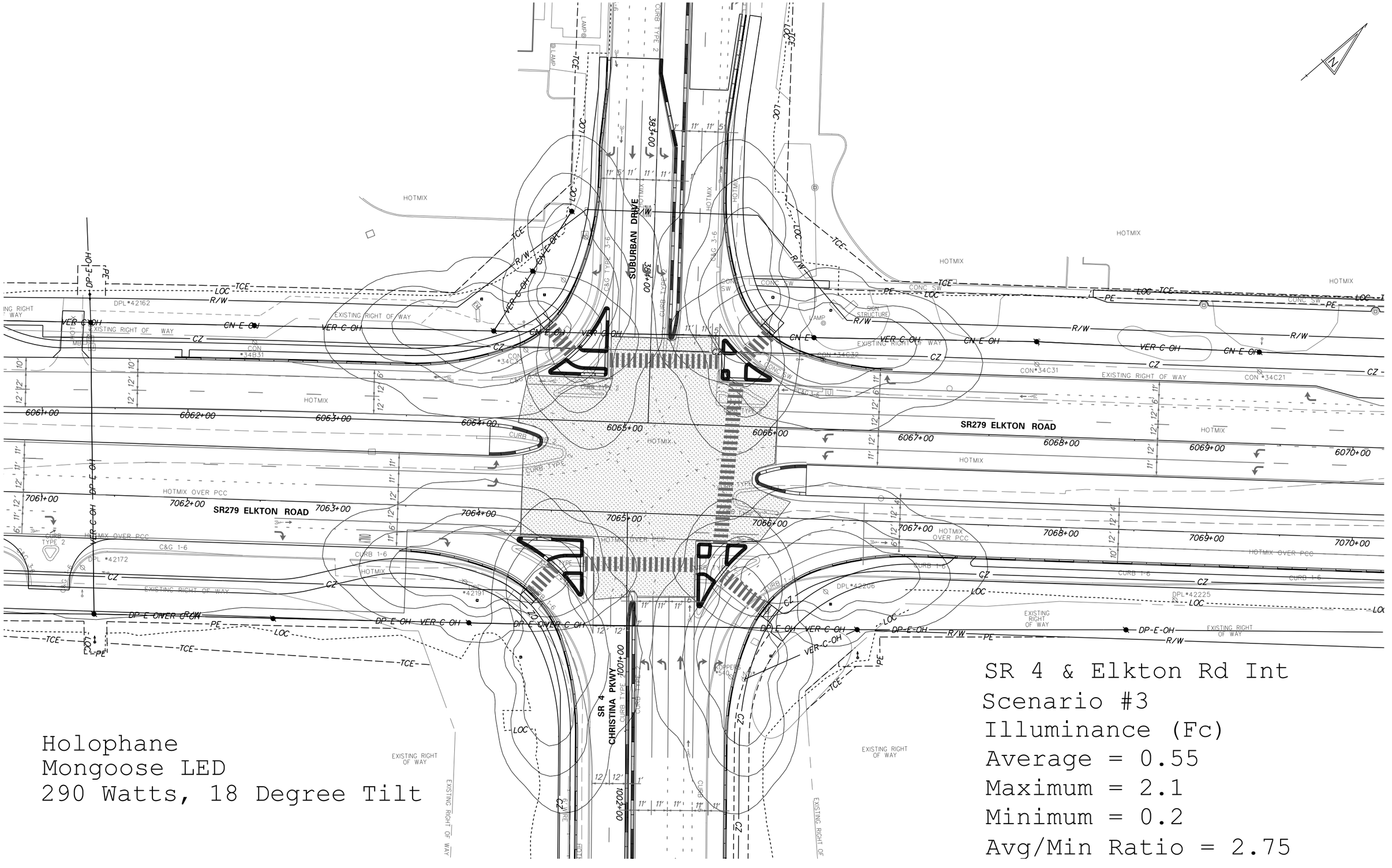
DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. N/A	LIGHTING PLAN	SHEET NO. 1
				COUNTY NEW CASTLE	DESIGNED BY: GYB		TOTAL SHTS. 15
					CHECKED BY: MAW		



American Electric
Autobahn Series LED
224 Watts

SR 4 & Elkton Rd Int
Scenario #2
Illuminance (Fc)
Average = 0.48
Maximum = 2.0
Minimum = 0.1
Avg/Min Ratio = 4.80

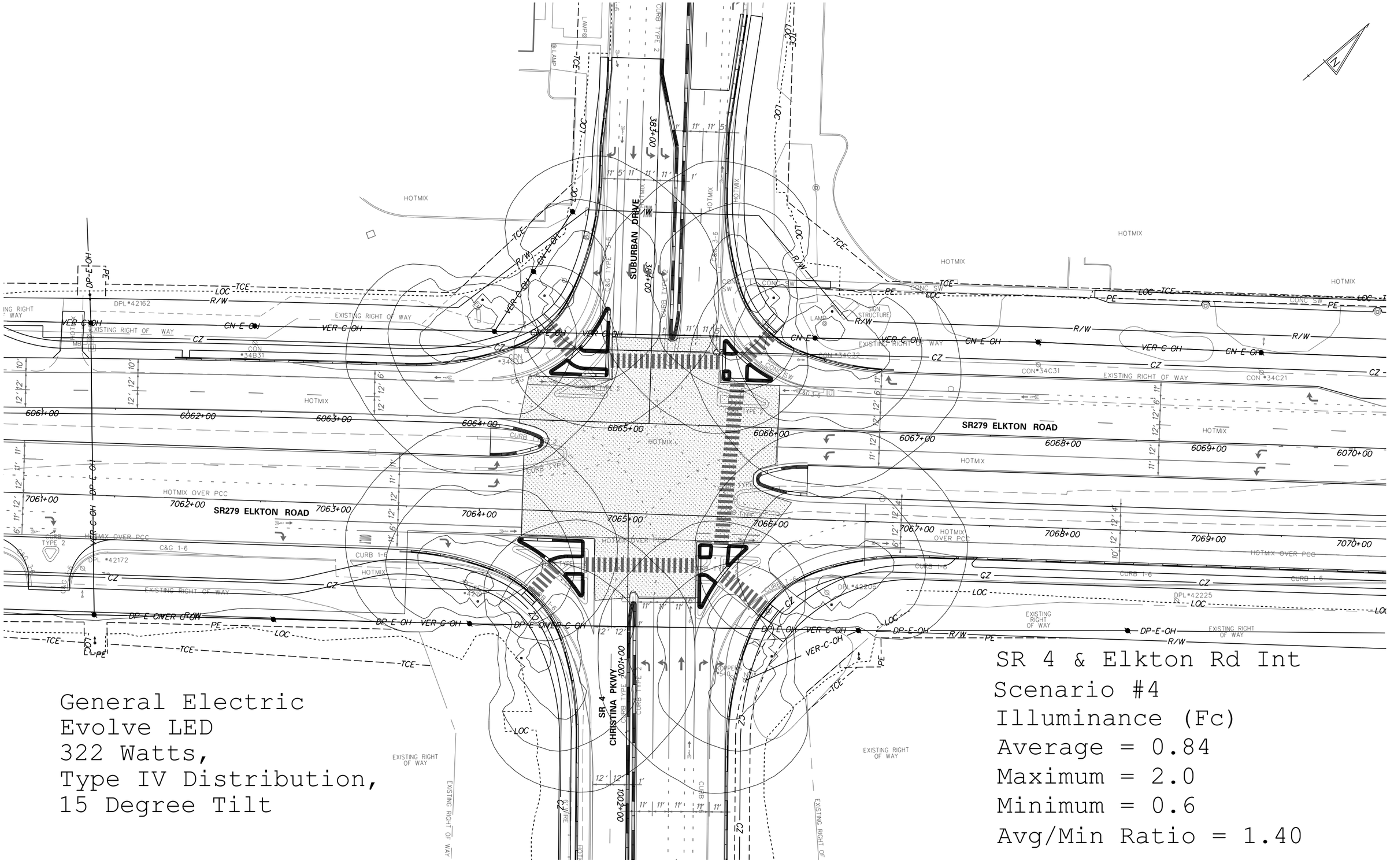
DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. N/A	LIGHTING PLAN	SHEET NO. 2
				COUNTY NEW CASTLE	DESIGNED BY: GYB		TOTAL SHTS. 15
					CHECKED BY: MAW		



Holophane
Mongoose LED
290 Watts, 18 Degree Tilt

SR 4 & Elkton Rd Int
Scenario #3
Illuminance (Fc)
Average = 0.55
Maximum = 2.1
Minimum = 0.2
Avg/Min Ratio = 2.75

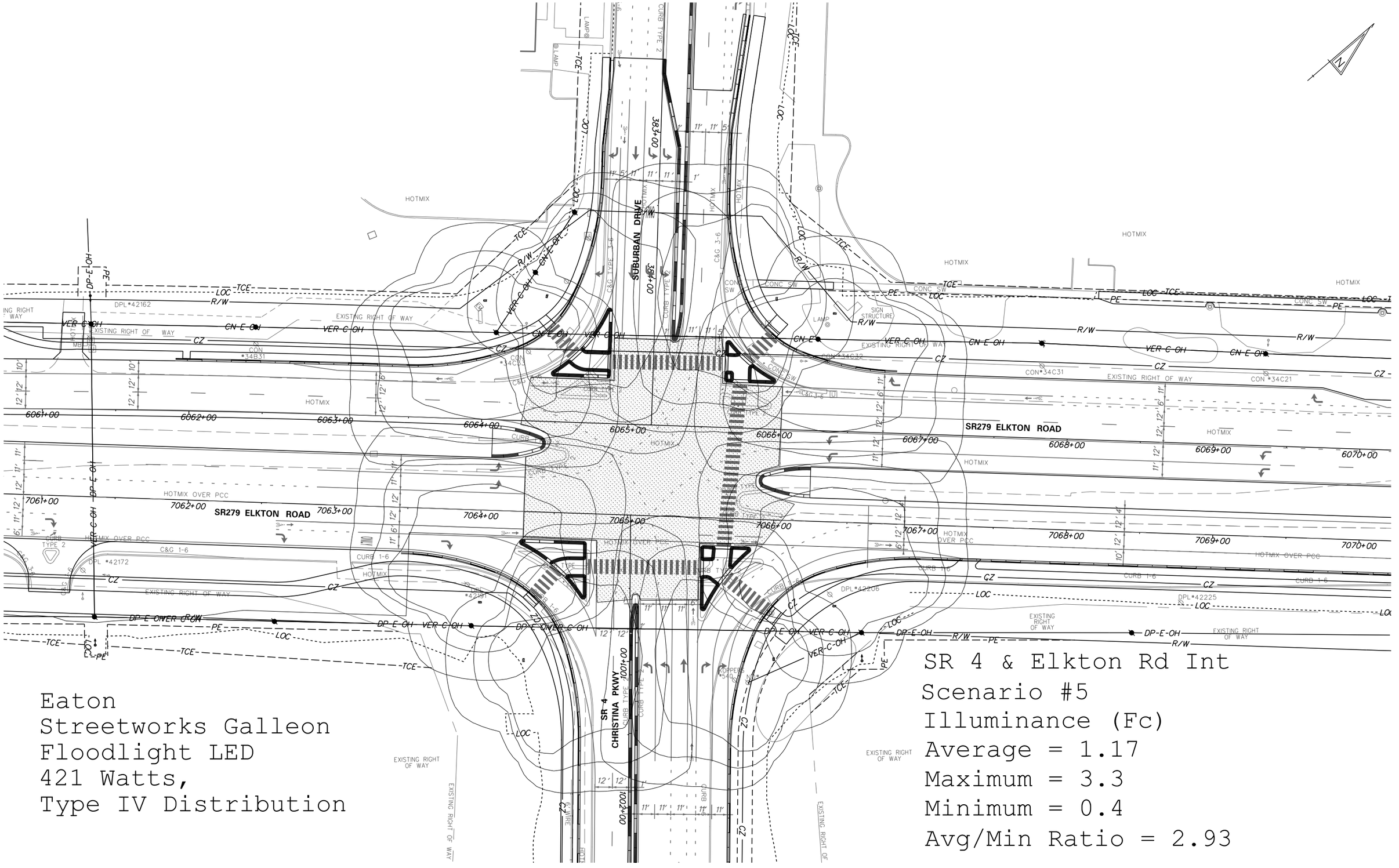
DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. N/A	LIGHTING PLAN
				COUNTY NEW CASTLE	DESIGNED BY: GYB	SHEET NO. 3
					CHECKED BY: MAW	TOTAL SHTS. 15



General Electric
Evolve LED
322 Watts,
Type IV Distribution,
15 Degree Tilt

SR 4 & Elkton Rd Int
Scenario #4
Illuminance (Fc)
Average = 0.84
Maximum = 2.0
Minimum = 0.6
Avg/Min Ratio = 1.40

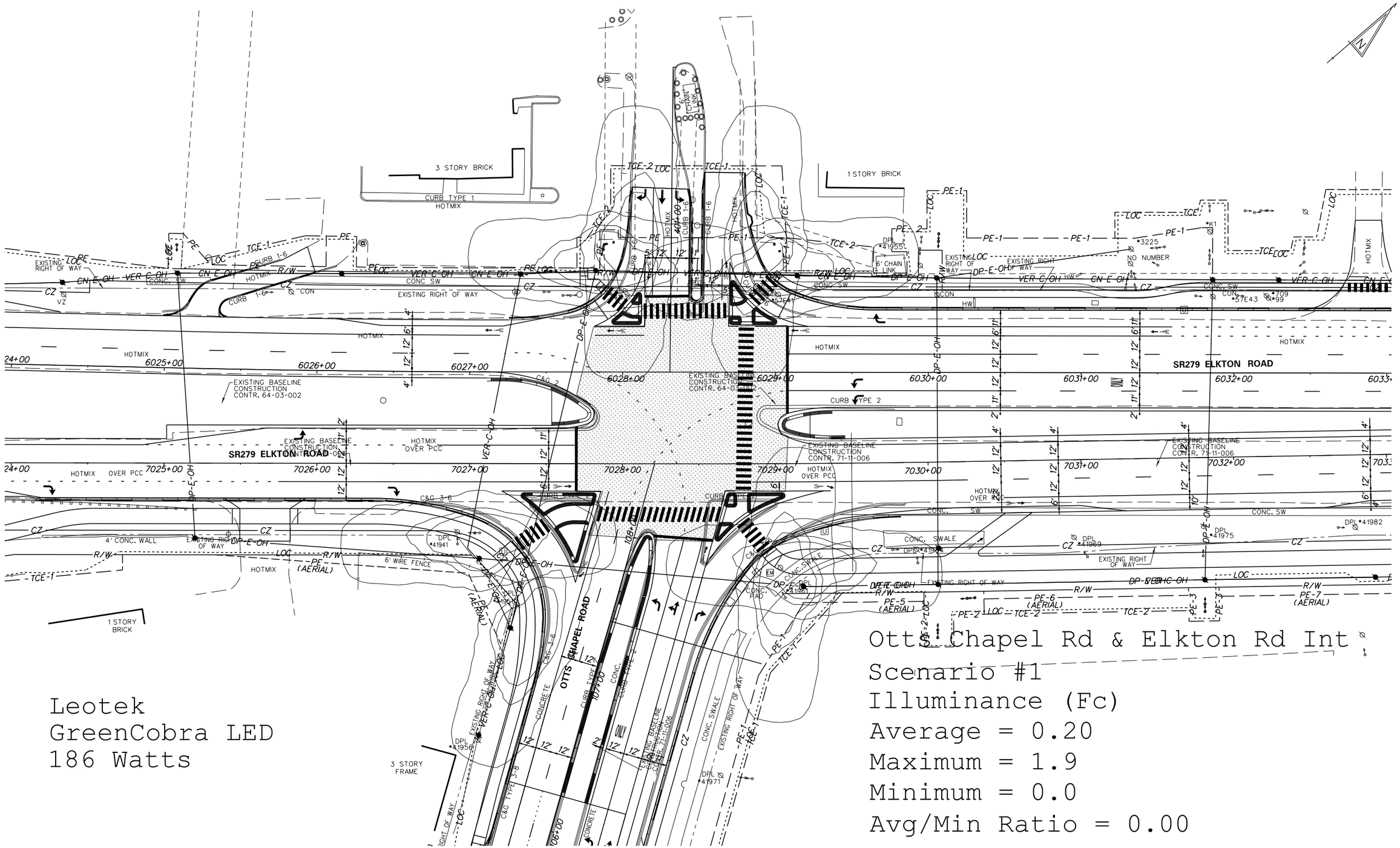
DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. N/A	LIGHTING PLAN	SHEET NO. 4
				COUNTY NEW CASTLE	DESIGNED BY: GYB		TOTAL SHTS. 15
					CHECKED BY: MAW		



Eaton
Streetworks Galleon
Floodlight LED
421 Watts,
Type IV Distribution

SR 4 & Elkton Rd Int
Scenario #5
Illuminance (Fc)
Average = 1.17
Maximum = 3.3
Minimum = 0.4
Avg/Min Ratio = 2.93

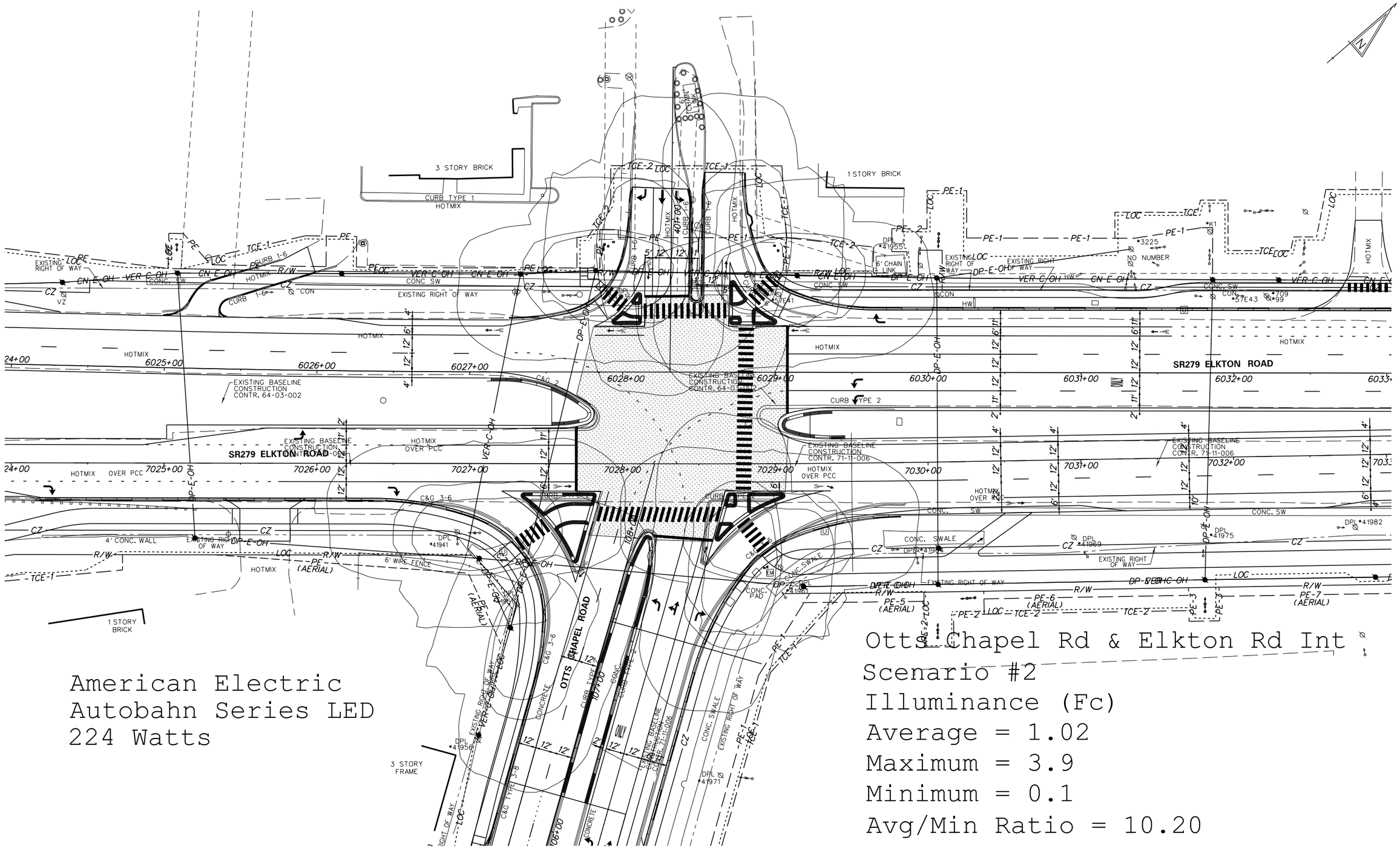
DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. N/A	LIGHTING PLAN	SHEET NO. 5
				COUNTY NEW CASTLE	DESIGNED BY: GYB		TOTAL SHTS. 15
					CHECKED BY: MAW		



Leotek
GreenCobra LED
186 Watts

Otts Chapel Rd & Elkton Rd Int
Scenario #1
Illuminance (Fc)
Average = 0.20
Maximum = 1.9
Minimum = 0.0
Avg/Min Ratio = 0.00

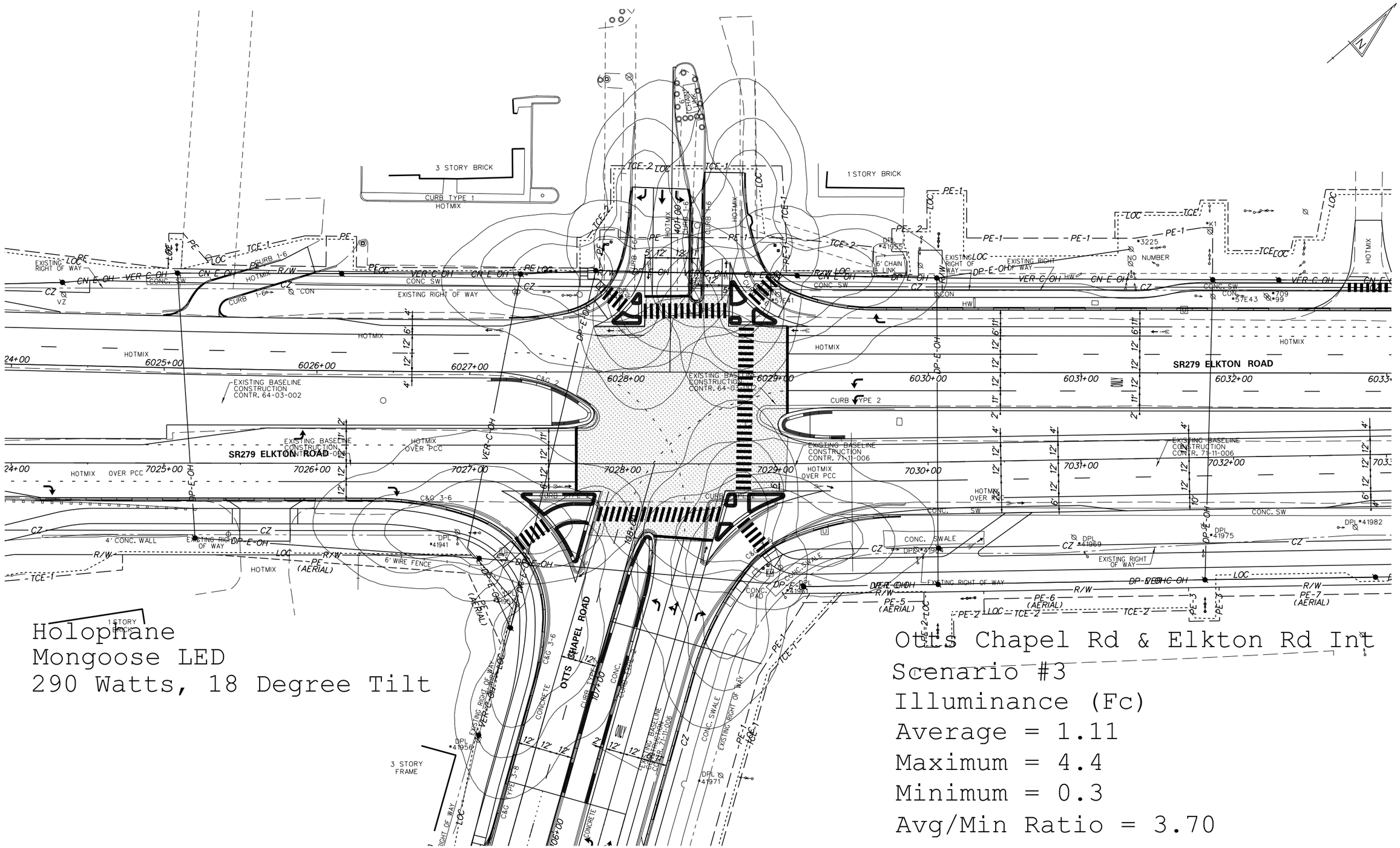
DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. N/A	LIGHTING PLAN	SHEET NO. 6
				COUNTY NEW CASTLE	DESIGNED BY: GYB		TOTAL SHTS. 15
					CHECKED BY: MAW		



American Electric
Autobahn Series LED
224 Watts

Otts Chapel Rd & Elkton Rd Int
Scenario #2
Illuminance (Fc)
Average = 1.02
Maximum = 3.9
Minimum = 0.1
Avg/Min Ratio = 10.20

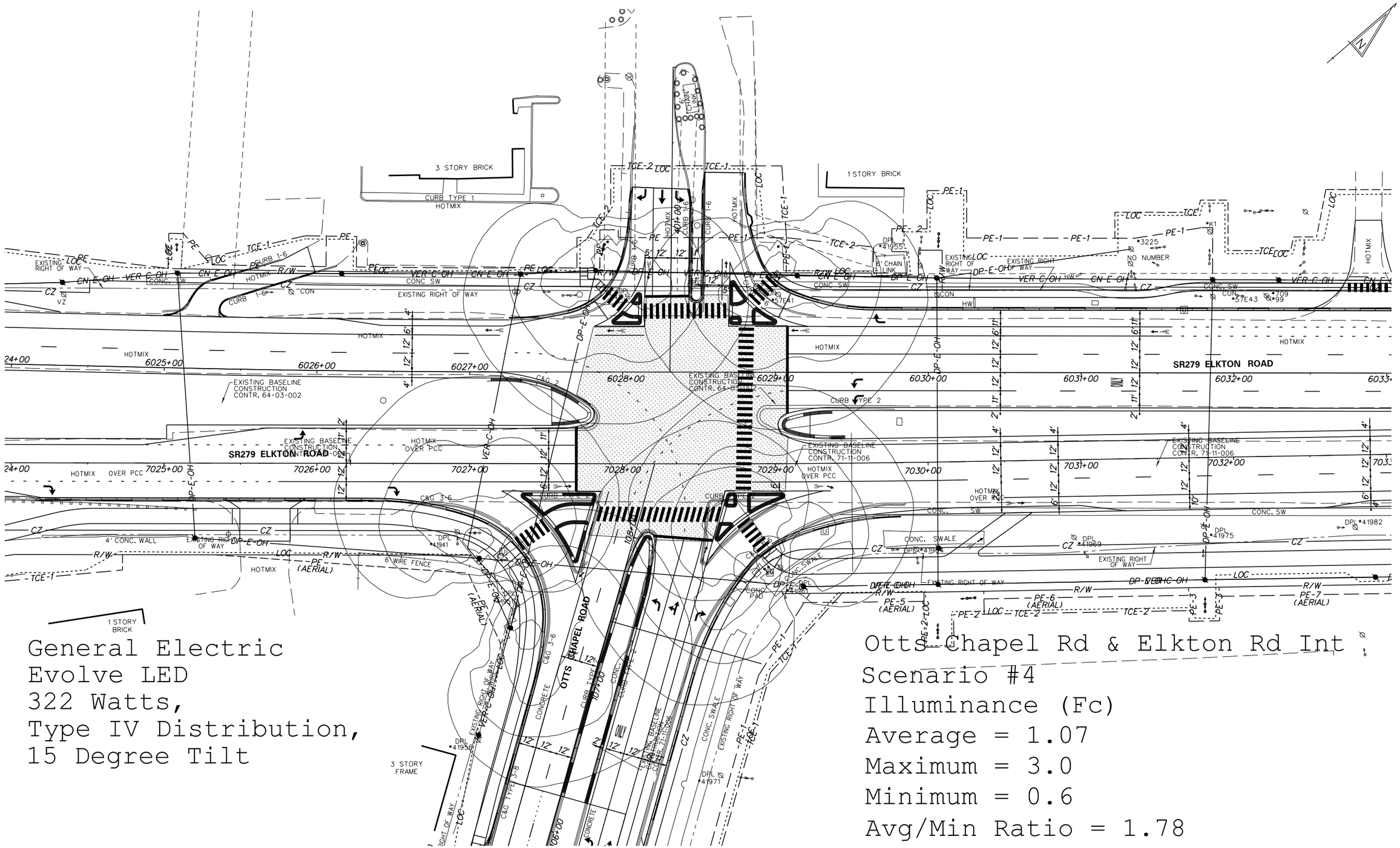
DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. N/A	LIGHTING PLAN	SHEET NO. 7
				COUNTY NEW CASTLE	DESIGNED BY: GYB		TOTAL SHTS. 15
					CHECKED BY: MAW		



Holophane
Mongoose LED
290 Watts, 18 Degree Tilt

Otts Chapel Rd & Elkton Rd Int
Scenario #3
Illuminance (Fc)
Average = 1.11
Maximum = 4.4
Minimum = 0.3
Avg/Min Ratio = 3.70

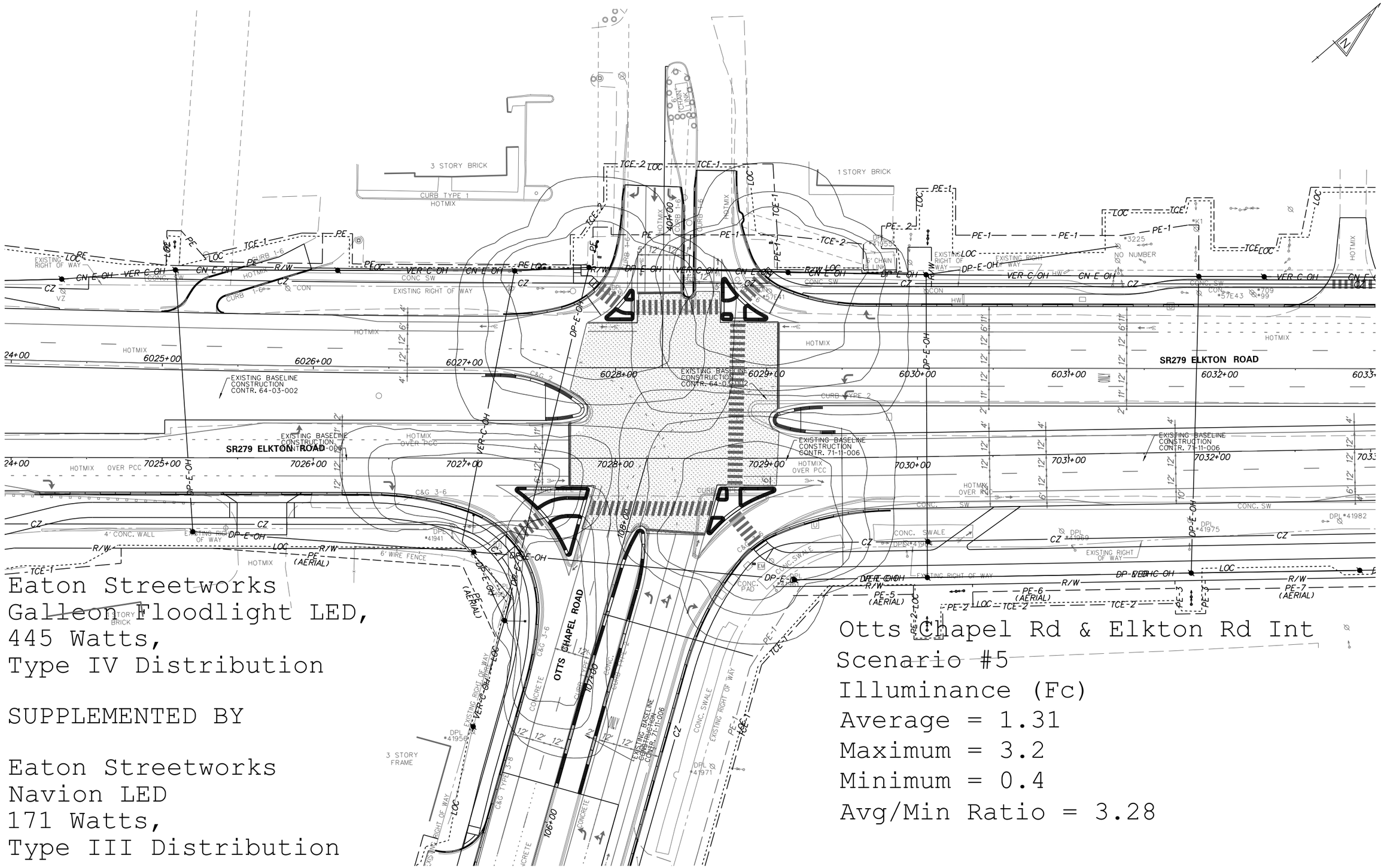
DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. N/A	LIGHTING PLAN	SHEET NO. 8
				COUNTY NEW CASTLE	DESIGNED BY: GYB		TOTAL SHTS. 15
					CHECKED BY: MAW		



General Electric
Evolve LED
322 Watts,
Type IV Distribution,
15 Degree Tilt

Otts Chapel Rd & Elkton Rd Int
Scenario #4
Illuminance (Fc)
Average = 1.07
Maximum = 3.0
Minimum = 0.6
Avg/Min Ratio = 1.78

DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. N/A	LIGHTING PLAN	SHEET NO. 9
				COUNTY NEW CASTLE	DESIGNED BY: GYB		TOTAL SHTS. 15
					CHECKED BY: MAW		



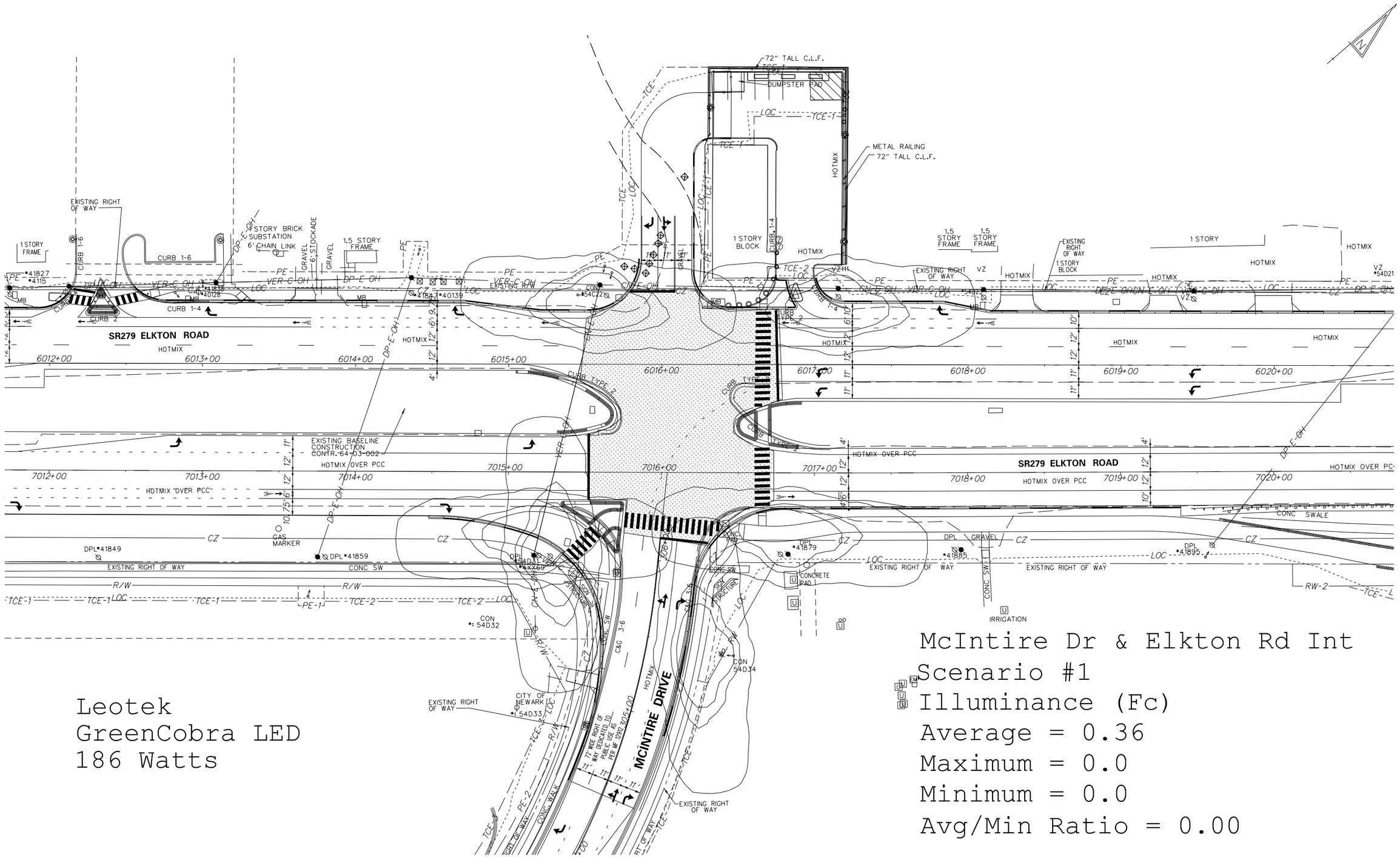
Eaton Streetworks
Galleon Floodlight LED,
445 Watts,
Type IV Distribution

SUPPLEMENTED BY

Eaton Streetworks
Navion LED
171 Watts,
Type III Distribution

Otts Chapel Rd & Elkton Rd Int
Scenario #5
Illuminance (Fc)
Average = 1.31
Maximum = 3.2
Minimum = 0.4
Avg/Min Ratio = 3.28

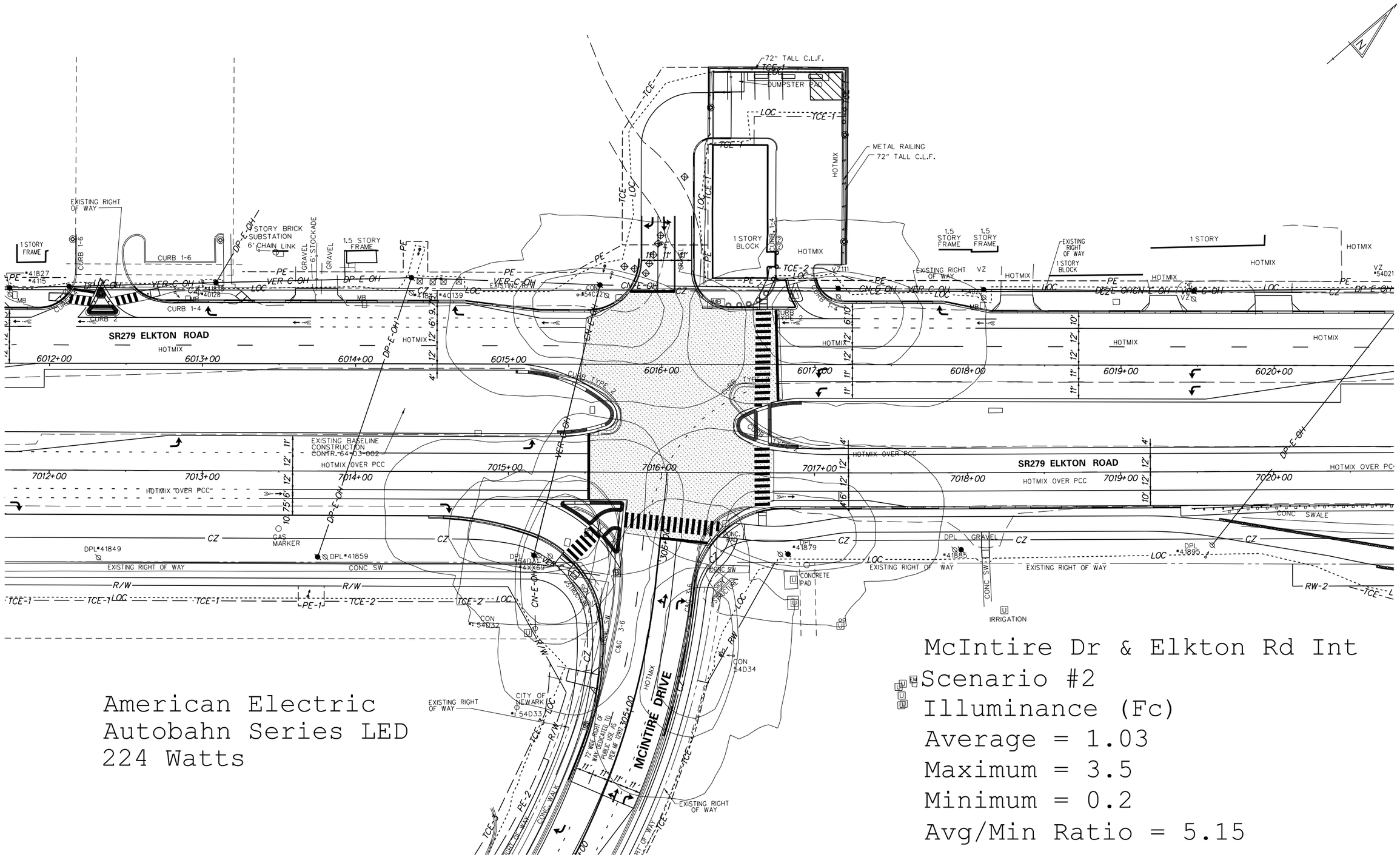
DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. N/A	LIGHTING PLAN	SHEET NO. 10
				COUNTY NEW CASTLE	DESIGNED BY: GYB		TOTAL SHTS. 15
					CHECKED BY: MAW		



Leotek
GreenCobra LED
186 Watts

McIntire Dr & Elkton Rd Int
Scenario #1
Illuminance (Fc)
Average = 0.36
Maximum = 0.0
Minimum = 0.0
Avg/Min Ratio = 0.00

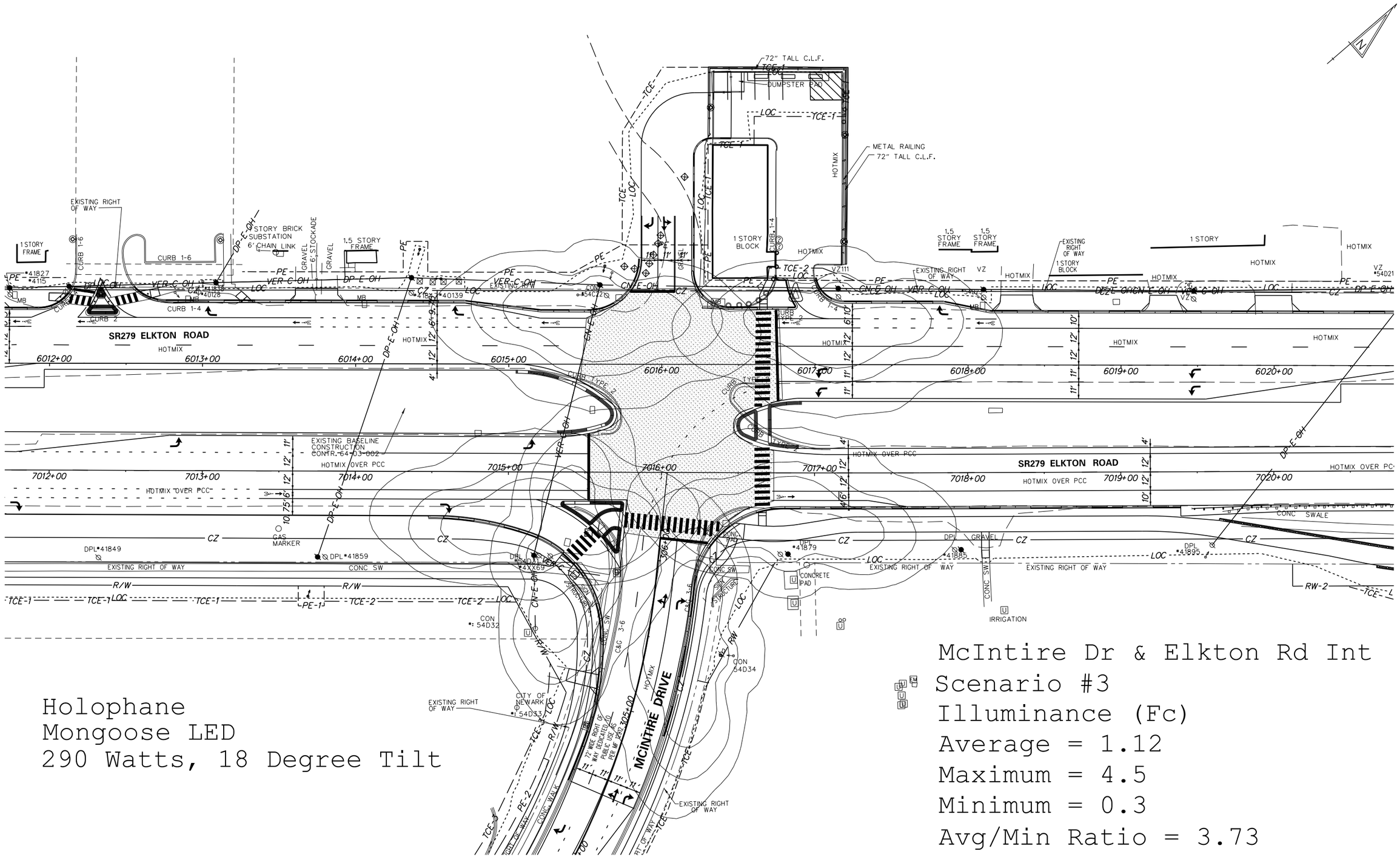
DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. N/A	LIGHTING PLAN	SHEET NO. 11
				COUNTY NEW CASTLE	DESIGNED BY: GYB		TOTAL SHTS. 15
					CHECKED BY: MAW		



American Electric
Autobahn Series LED
224 Watts

McIntire Dr & Elkton Rd Int
Scenario #2
Illuminance (Fc)
Average = 1.03
Maximum = 3.5
Minimum = 0.2
Avg/Min Ratio = 5.15

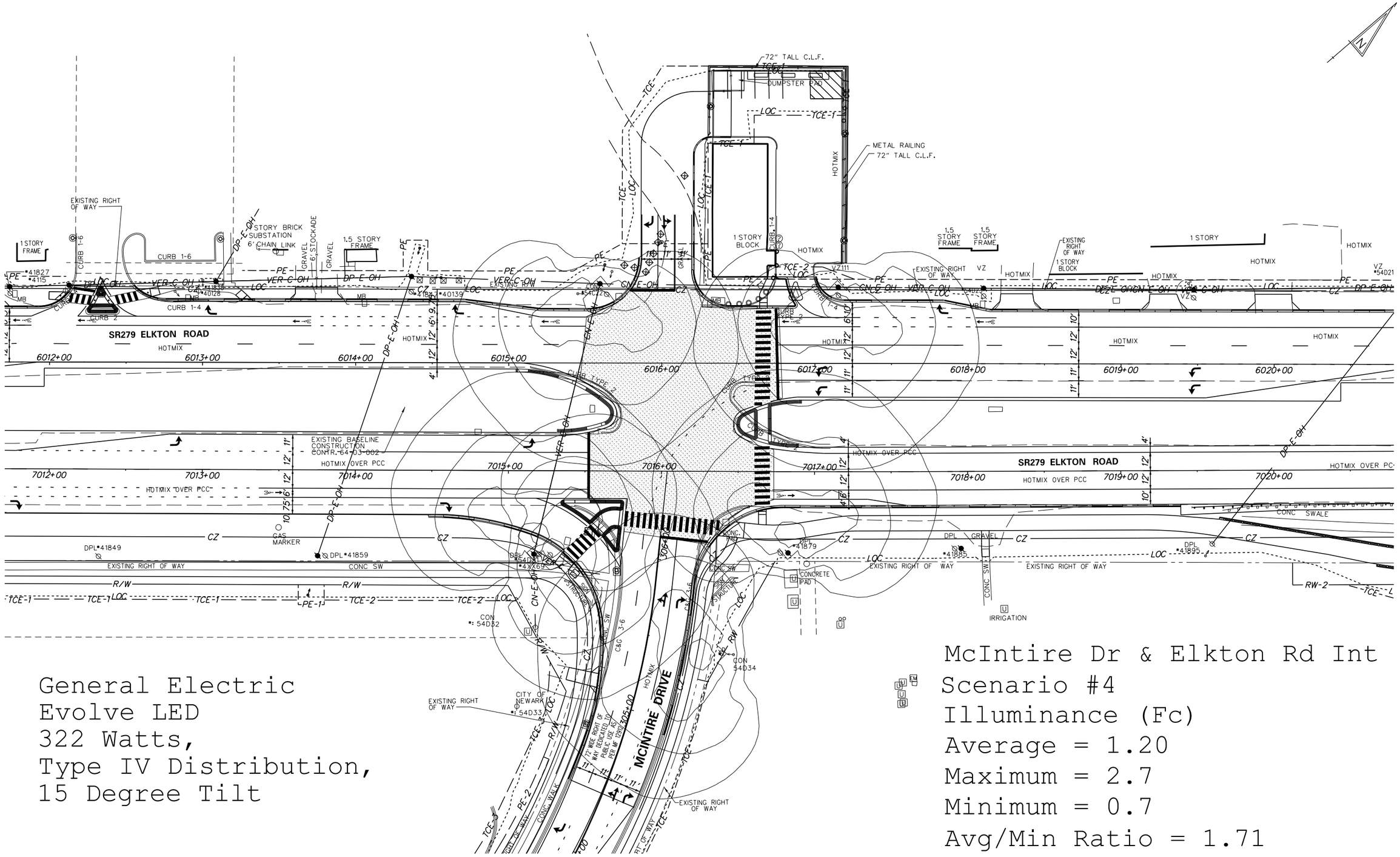
DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. N/A	LIGHTING PLAN	SHEET NO. 12
				COUNTY NEW CASTLE	DESIGNED BY: GYB		TOTAL SHTS. 15
					CHECKED BY: MAW		



Holophane
Mongoose LED
290 Watts, 18 Degree Tilt

McIntire Dr & Elkton Rd Int
Scenario #3
Illuminance (Fc)
Average = 1.12
Maximum = 4.5
Minimum = 0.3
Avg/Min Ratio = 3.73

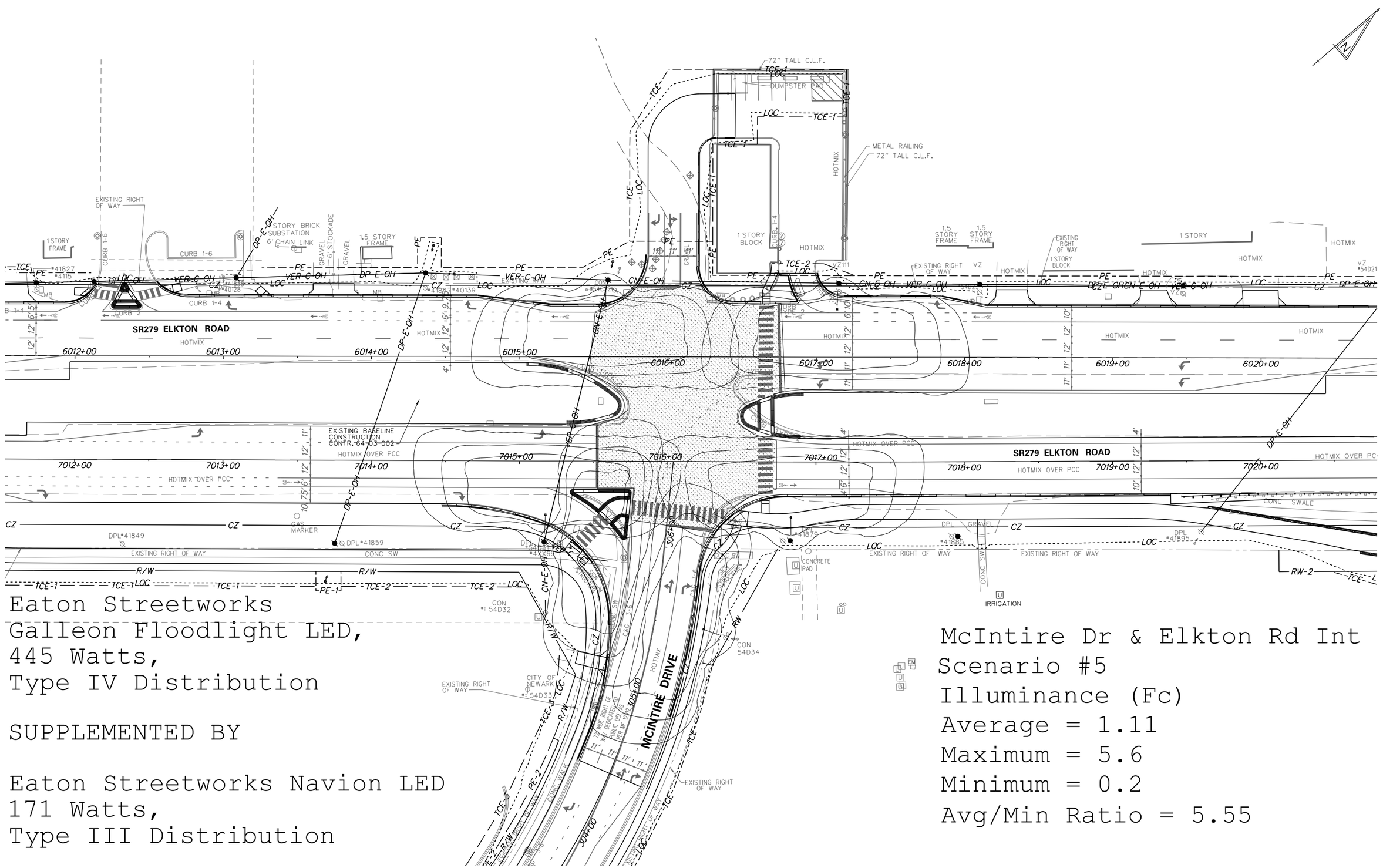
DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. N/A	LIGHTING PLAN	SHEET NO. 13
				COUNTY NEW CASTLE	DESIGNED BY: GYB		TOTAL SHTS. 15
					CHECKED BY: MAW		



General Electric
Evolve LED
322 Watts,
Type IV Distribution,
15 Degree Tilt

McIntire Dr & Elkton Rd Int
Scenario #4
Illuminance (Fc)
Average = 1.20
Maximum = 2.7
Minimum = 0.7
Avg/Min Ratio = 1.71

DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. N/A	LIGHTING PLAN
				COUNTY NEW CASTLE	DESIGNED BY: GYB	SHEET NO. 14
					CHECKED BY: MAW	TOTAL SHTS. 15



Eaton Streetworks
Galleon Floodlight LED,
445 Watts,
Type IV Distribution

SUPPLEMENTED BY

Eaton Streetworks Navion LED
171 Watts,
Type III Distribution

McIntire Dr & Elkton Rd Int
Scenario #5
Illuminance (Fc)
Average = 1.11
Maximum = 5.6
Minimum = 0.2
Avg/Min Ratio = 5.55

DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	SCALE 0 30 60 90 FEET	ELKTON ROAD MD LINE TO CASHO MILL ROAD	CONTRACT T201504401	BRIDGE NO. N/A	LIGHTING PLAN	SHEET NO. 15
				COUNTY NEW CASTLE	DESIGNED BY: GYB		TOTAL SHTS. 15
					CHECKED BY: MAW		

APPENDIX Q.
TRAFFIC SYSTEMS DESIGN HANDOFF FORM

NOTE: PLEASE CHECK DELDOT'S WEBSITE FOR THE LATEST UPDATES
(https://deldot.gov/Publications/manuals/traffic_design/index.shtml)

Traffic Systems Design Handoff Form

169 Brick Store Landing Road, Smyrna, DE

Project Name: _____

Contract/Project No.: _____ **Maximo No.:** _____

Designer Name: _____ **Date:** _____

Handoff To: ☐ Traffic Construction ☐ Power Company _____
☐ Traffic Maintenance ☐ Other: _____

Project Type: ☐ Capital ☐ Traffic ☐ Pave & Rehab
☐ Pavement Markings ☐ Signing ☐ OIT
☐ Power Company Lighting ☐ Developer ☐ Other: _____

Permit Number(s): _____

Description: _____

Project Justification: _____

Funding Approval: ☐ Yes ☐ No

Funding Notes: _____

Priority: ☐ ASAP ☐ High ☐ Normal
☐ Support Expected Start: _____

Communication/ITS Needs: (i.e., fiber, CDMA, etc.) _____

Fiber Quote?: ☐ Yes ☐ No

Special MOT Notes: (Time Restrictions, Ped MOT, etc.) _____

Pedestrian MOT Required?: ☐ Yes ☐ No **By? (initials)** _____

Overhead Signing: ☐ Yes ☐ No

Timesheet Status: ☐ Complete ☐ Pending ☐ Not Required

Public Relations: DelDOT PR lead: _____
☐ PCMS ☐ Press Release ☐ None
☐ Other: _____

Version: ☐ Original ☐ Revision Number: _____

Comments: (e.g. special order items, decorative poles, APS, etc.) _____

Soil Boring (s) complete: ☐ Yes ☐ No **Soil Boring Project Number:** _____

File Name and Location _____

Attachments: **Plans:** ☐ Yes ☐ File Location: _____
Estimates: ☐ Yes ☐ File Location: _____
Other: ☐ _____

Mast Arm Review: ☐ Union Metal ☐ TST **Date:** _____

Verify Traffic Signal Resolution Exists: ☐ Yes ☐ File Location:
☐ No, coordinate with Traffic Studies Manager

Form Date: 10/16/2019

Traffic Systems Design Handoff Form

169 Brick Store Landing Road, Smyrna, DE

Handoff Email Distribution List

Signal Construction
Mark Luszcz Peter Haag
Mark Harbeson
Eddie Toulson
Mike Havel
Jack Hardy
Frank Motley
Will Newcomb
Dustin Shane

Signal Maintenance
Rob Kern (NCCo only)
Erin Remus (Kent and Sussex only)
Dan Schmeusser

Design
Max Saintil Naa-Atswei Tetteh
Scott Neidert
Renford Brevett

Finance
Amanda Davis

Safety
Don Weber
Mark Buckalew
Jerry Nagyiski
Marvin Pedigo (North)
Martin Lord (NCCo Canal)
Dan Thompson (Sussex only)

TMC/Operations
Gene Donaldson
Jeff VanHorn
Jim Bunting
Rodney Mullnack

Public Relations
Louise Holt

Legislative Relations
Aimee String & Meaghan Barna**

M & O
Geri C. Larson++++

Architectural Accessibility Board
Jennifer Lieber

Bridge Design
Jason Hastings*
Jason Arndt*
Nathan Draper*

Business Management
Gloria Acevedo#
Linda Saulsbury#
Rick Tracy#

* *Bridge reviews all non-breakaway poles*
** *For Press Release related to Traffic Only projects*

HazMat
Maureen Kelley
Jeff Leonard

Signing
Nick Mogle
[illegible]
Bob McNamire
Lee Benningfield (NCCo only)
Tim Weishaupt (Kent only)
Denise Coulbourne (Sussex only)

North District
Brian Schilling# Stewart Douglass#
Gerard Mulderrig## Anthony Riccio#
Frank Pepper#

Central & South District
Jason McCluskey# Gemez Norwood###
Alastair Probert# Richard McCabe###

\# *for District lighting projects only*
\## *for all lighting projects statewide*
\### *for Developer projects only*

OIT+
Dave Gray+ Travis Hewitt+
Dan Akeme+ Scott Sieg+
Daryl Harris+ Ron Galbreath+++
Denise Ksiazek++
Jason Rashid

ADA
Tom Nickel

Utilities
Eric Cimo

\+ *only when project has ITMS communications involvement*
++ *only when project has fiber involvement*
+++ *only when project requires ITMS data circuit coordination with Verizon*
++++ *only when project involves CTF funds*

Rail
Scott Neidert

Traffic Studies
Peter Haag^
Initiating Staff Member ^

^ *only for projects initiated by Traffic Studies*

General Note:
Power company lighting projects only need to be handed off to the Power Company, Design, Finance, Business Management, and District.

APPENDIX R.
CONCURRENCE FORM

STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
800 BAY ROAD
P.O. BOX 778
DOVER, DELAWARE 19903

JENNIFER COHAN
SECRETARY

MEMORANDUM

TO: Peter Haag, Chief of Traffic Engineering

VIA: Max Saintil, Traffic Systems Design Manager

FROM: **[Enter]**, Traffic Design Engineer

DATE: **[Enter]**

SUBJECT: **Supporting Section Clearances for Traffic Section On-Call Construction Project**

The Delaware Department of Transportation (DelDOT) Traffic Section has prepared final construction plans for the project stated below and reference materials have been verified, as noted below, for field implementation via on-call construction contract (DOT1801 TRAFFIC SIGNALS & DOT1802 TRAFFIC MAINTENANCE & ITS – Traffic Signals, Lighting, and ITS Installation, Statewide), or fiber contract (DOT1885F ITMS FIBER NETWORK). The items noted below were completed prior to the commencement of construction:

Contract No. **[Enter]**
F.A.P. No. **[Enter]**
Project Title **[Enter]**
Permit No. **[Enter]**

Right of Way

☐ No anticipated right of way impacts based on archived plans, tax map research, and field assessments
☐ Executed and/or recorded Traffic Signal and Maintenance Agreement on file – see enclosed approved plan(s)
☐ Enclosed Right of Way Certificate dated [Date]

Environmental Studies

☐ Enclosed Categorical Exclusion dated [Date]

Utilities

☐ No anticipated utility involvement based on archived plan research, Miss Utility of Delmarva notification, and field assessments
☐ Utility coordination, as noted on approved plan(s) – see enclosure

Railroad

☐ No anticipated railroad involvement based on archived plan research and field assessments
☐ Railroad coordination, as noted on approved plan(s) – see enclosure

Concurred by: _____ Date: _____
Chief of Traffic Engineering

Enclosures
cc: Project File

DelDOT

APPENDIX S.
ENVIRONMENTAL CLEARANCE EXAMPLE

Rehm, Kassidy

From: Wahed, Mir
Sent: Monday, November 18, 2019 12:16 PM
To: Rehm, Kassidy; Kusy, Ryan
Cc: Smith, James
Subject: FW: T202004001 - Environmental Review and Approval for Prices Corner Interchange Lighting

FYI.

From: Krofft, Heidi (DelDOT) <Heidi.Krofft@delaware.gov>
Sent: Friday, November 15, 2019 12:51 PM
To: Saintil, Max (DelDOT) <Max.Saintil@delaware.gov>
Cc: Caruano, John (DelDOT) <John.Caruano@delaware.gov>; Davis, Amanda (DelDOT) <Amanda.Davis@delaware.gov>; Tetteh, Naa-Atswei (DelDOT) <Naa-Atswei.Tetteh@delaware.gov>; Wahed, Mir <MWahed@jmt.com>
Subject: [EXTERNAL] RE: T202004001 - Environmental Review and Approval for Prices Corner Interchange Lighting

Max,

We have reviewed the project add-on location (Prices Corner Interchange Lighting) for state contract T202004001, FY20 Intersection Improvement Program; Federal Project Number ESTP-2019(16). This project is consistent with 23 CFR 771.117(c)(2) under our current CatEx Programmatic Agreement with FHWA; therefore, I am authorizing NEPA approval for this work.

There are no environmental permits (including but not limited to, US Army Corps of Engineers, DNREC Wetlands and Subaqueous Lands, Coast Guard) or environmental construction restrictions associated with this project.

As a result of the current project coordination, this project is exempt from SHPO review under Stipulation III of our current Section 106 Programmatic Agreement with SHPO and FHWA. There are no cultural resource concerns as long as the project scope is not modified and all staging and stockpiling remains within the existing roadway footprint. Should it be necessary to add additional access locations or other stockpiling/staging areas, DelDOT Environmental Studies staff will need to review these areas for potential cultural and natural resources concerns.

A copy of this email will be retained on file as a record.
Thanks,
Heidi

From: Saintil, Max (DelDOT)
Sent: Friday, November 08, 2019 3:08 PM
To: Krofft, Heidi (DelDOT) <Heidi.Krofft@delaware.gov>
Cc: Caruano, John (DelDOT) <John.Caruano@delaware.gov>; Davis, Amanda (DelDOT) <Amanda.Davis@delaware.gov>; Tetteh, Naa-Atswei (DelDOT) <Naa-Atswei.Tetteh@delaware.gov>; Mir Wahed (mwahed@jmt.com) <mwahed@jmt.com>
Subject: T202004001 - Environmental Review and Approval for Prices Corner Interchange Lighting

Good afternoon Heidi,

The following lighting project is being submitted for environmental review and approval:

Project number: T202004001 - FY20 Intersection Improvements Program, Federal ESTP-2019(16)
Location: Prices Corner Interchange (SR 141 and SR 2)
https://www.google.com/maps/@39.7352628,-75.6192674,1101m/data=!3m1!1e3
Scope: Lighting Improvements and reconstruction (131 fixtures total)
Work Proposed Outside of Right of Way: None

Thank you for your help!

Max Saintil
DelDOT - Traffic Systems Design
(SLC : N230A)
169 Brick Store Landing Rd.
Smyrna, DE 19977
☎: (302) 659-4078 (Voice)
: (302) 653-2860 (Fax)
Max.Saintil@state.de.us

APPENDIX T.
CONTRACT WORK HOUR RESTRICTIONS CHECKLIST:

1. TYPICAL CONTRACT

NOTE: PLEASE CHECK DELDOT'S WEBSITE FOR THE LATEST UPDATES (https://deldot.gov/Business/drc/index.shtml?dc=projectmanagement)

DelDOT | Contract Work Hour Restrictions Checklist

Project Title	SR1 and SR16 Grade Separated Intersection
Contract Number	T201500301
Federal Aid Project Number	ESTP-S014(14)
Project Schedule	
Anticipated PS&E Date	January 2, 2018
Anticipated Advertisement Date	April 2, 2018
Anticipated Start of Construction	October 1, 2018
Anticipated Construction Duration	730 Days
Maintenance of Traffic/Safety Considerations	
Maintenance of Traffic Breakout Sheet Needed? (For All-Inclusive MOT Only)	Yes No
Work hour/lane closure restriction table	Yes No If yes, provide details.
Road closures/detours	Yes No If yes, provide details.
Pedestrian/bicyclist MOT/detours	Yes No If yes, provide details.
Holiday/event/seasonal restrictions	Yes No If yes, provide details.
Traffic Officers Needed? Est. Calendar Days?	Yes No If yes, provide details.
Portable Changeable Message Boards Needed? New traffic pattern notifications	Yes No If yes, provide details.
ATSSA supervisor requirement	Yes No If yes, provide details.
TMP monitoring (e.g., signal timing adjustments along detour routes)	Yes No If yes, provide details.
Coordination required with adjacent project(s) work zones	Yes No If yes, provide details.
Property owner/business notifications	Yes No If yes, provide details.
Contractor Performance Requirements	
Disincentive Spec (Damages based on User Cost Delay)	Yes No If yes, provide details.
Incentive Spec (Incentive payment for meeting schedule milestone dates)	Yes No If yes, provide details.
Interim Milestone Dates	Yes No If yes, provide details.

| Contract Work Hour Restrictions Checklist

Public Outreach Efforts to be Performed by Community Relations	
Legislator briefing (list timing and frequency)	Yes No If yes, provide details.
Public Workshop (list timing and frequency)	Yes No If yes, provide details.
Community Advisory Meetings (list timing and frequency)	Yes No If yes, provide details.
Personal meetings with stakeholders (list timing and frequency)	Yes No If yes, provide details.
Press Release (list timing and frequency)	Yes No If yes, provide details.
Project Newsletter (list format, timing and frequency)	Yes No If yes, provide details.
Create and maintain project webpage (list update frequency)	Yes No If yes, provide details.
Radio Spot (list timing and frequency)	Yes No If yes, provide details.
TV Spot (list timing and frequency)	Yes No If yes, provide details.

In Concurrence:

Signature	Date
_____ Group Engineer, Construction	_____
_____ Assistant Director Transportation Solutions, Construction	_____
_____ Safety Programs Manager, Traffic	_____
_____ Group Engineer, Project Development	_____
_____ Chief Traffic Engineer	_____
_____ Chief, Community Relations	_____

APPENDIX T.
CONTRACT WORK HOUR RESTRICTIONS CHECKLIST:
2. OPEN END CONTRACT

NOTE: PLEASE CHECK DELDOT'S WEBSITE FOR THE LATEST UPDATES (https://deldot.gov/Business/drc/index.shtml?dc=projectmanagement)

| Location Work Hour Restrictions Checklist for Open-End Projects

Project Title	SR1 and SR16 Grade Separated Intersection
Contract Number	T201500301
Federal Aid Project Number	ESTP-S014(14)
Work Order Location	ESTP-S014(14)
Project Schedule	
Anticipated Construction Start	October 1, 2018
Anticipated Construction Duration	730 Days
Maintenance of Traffic/Safety Considerations	
Maintenance of Traffic Breakout Sheet Needed? (For All-Inclusive MOT Only)	Yes No
Work hour/lane closure restriction table	Yes No If yes, provide details.
Road closures/detours	Yes No If yes, provide details.
Pedestrian/bicyclist MOT/detours	Yes No If yes, provide details.
Holiday/event/seasonal restrictions	Yes No If yes, provide details.
Traffic Officers Needed? Est. Calendar Days?	Yes No If yes, provide details.
Portable Changeable Message Boards Needed? New traffic pattern notifications	Yes No If yes, provide details.
ATSSA supervisor requirement	Yes No If yes, provide details.
TMP monitoring (e.g., signal timing adjustments along detour routes)	Yes No If yes, provide details.
Coordination required with adjacent project(s) work zones	Yes No If yes, provide details.
Property owner/business notifications	Yes No If yes, provide details.
Contractor Performance Requirements	
Disincentive Spec (Damages based on User Cost Delay)	Yes No If yes, provide details.
Incentive Spec (Incentive payment for meeting schedule milestone dates)	Yes No If yes, provide details.
Interim Milestone Dates	Yes No If yes, provide details.
Public Outreach Efforts to be Performed by Community Relations	
Legislator briefing (list timing and frequency)	Yes No If yes, provide details.
Public Workshop (list timing and frequency)	Yes No If yes, provide details.
Community Advisory Meetings (list timing and frequency)	Yes No If yes, provide details.

| Location Work Hour Restrictions Checklist for Open-End Projects

Personal meetings with stakeholders (list timing and frequency)	Yes No If yes, provide details.
Press Release (list timing and frequency)	Yes No If yes, provide details.
Project Newsletter (list format, timing and frequency)	Yes No If yes, provide details.
Create and maintain project webpage (list update frequency)	Yes No If yes, provide details.
Radio Spot (list timing and frequency)	Yes No If yes, provide details.
TV Spot (list timing and frequency)	Yes No If yes, provide details.
Statement Status	
Traffic Statement	○ Completed Provide details.
Sign Shop involvement	Yes No
Signal Construction involvement	Yes No
Utility Statement	○ Completed Provide details.
"Make-ready" Utilities/Power Feeds	Yes No
Leased/tariff lighting	Yes No
ROW Statement	○ Completed Provide details.
Environmental Statement	○ Completed Provide details.
Railroad Statement	○ Completed Provide details.

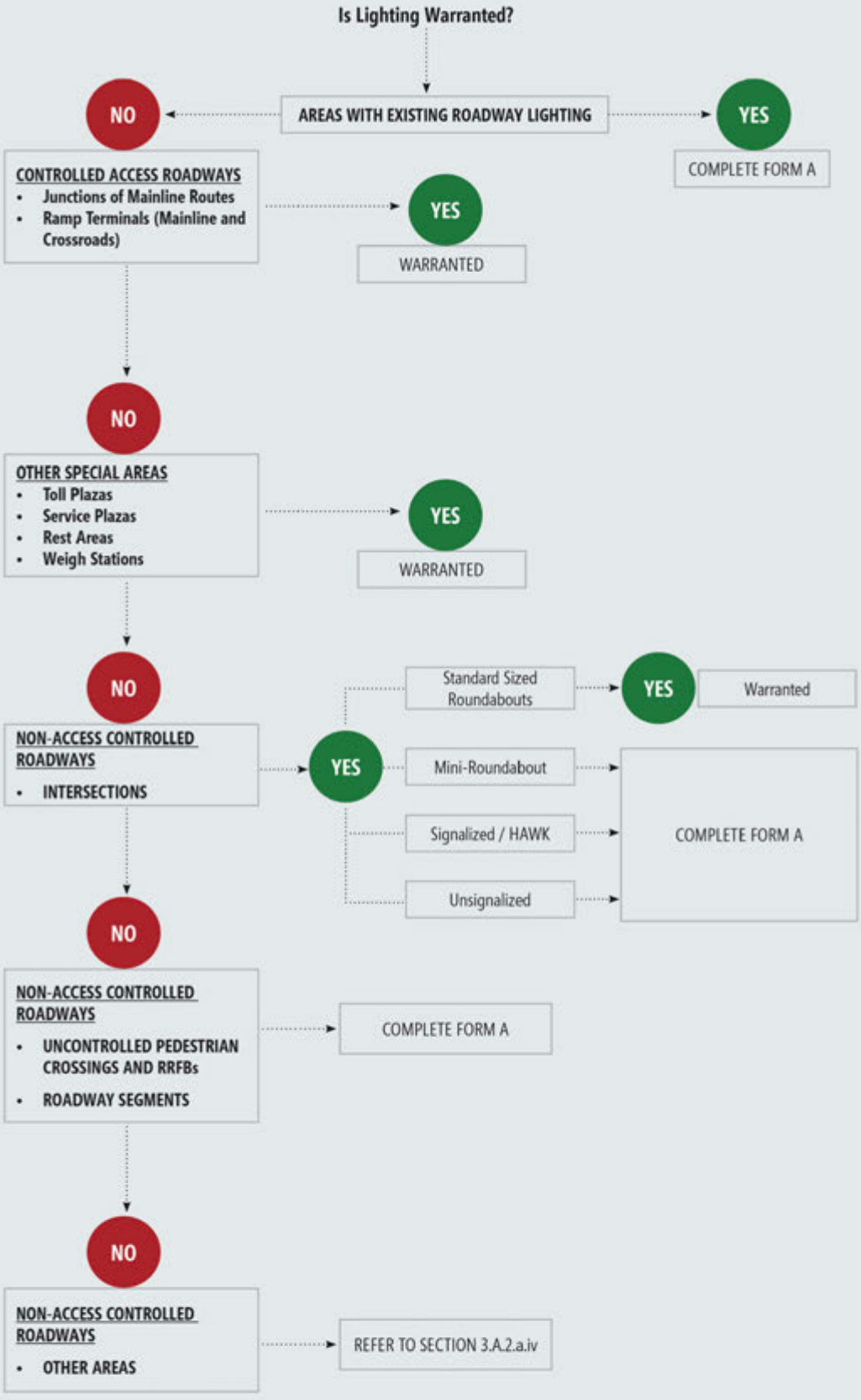
In Concurrence:

Signature	Date
_____ Project Manager	_____
_____ Safety Programs Manager, Traffic	_____
_____ Chief, Community Relations	_____

Note: Attach completed checklist to Maximo work order

APPENDIX U.
LIGHTING WARRANT FLOW CHART

LIGHTING WARRANTS FLOW CHART



APPENDIX V.
LIGHTING WARRANT FORM

FORM A	LIGHTING WARRANT EVALUATION FOR NON-ACCESS CONTROLLED INTERSECTIONS, UNCONTROLLED PEDESTRIAN CROSSINGS, AND ROADWAY SEGMENTS AS WELL AS AREAS WITH EXISTING ROADWAY LIGHTING

	CRITERIA			SCORE Met = 1 Not Met = 0 (A)	WEIGHT (B)	TOTAL (A x B)
A.	Functional Classification of Major Road		Other Principal Arterial		5	
			Minor Arterial		4	
			Major / Minor Collector		3	
			Local		2	
B.	AADT[1]	Major Road AADT > 11,000 and Minor Road > 4,000			5	
		Major Road AADT > 8,500 and Minor Road > 2,000			3	
		Major Road AADT > 10,000			2	
		Major Road AADT > 8,500 and Minor Road is a Non-State-Maintained Roadway or a Subdivision			1	
C.	Highest posted speed for any approach		>40MPH		5	
			>25 MPH – 40 MPH		3	
			25 MPH or below		2	
D.	Does any approach[2] not meet the required stopping sight distance (SSD)?				3	
E.	Pedestrian Crosswalk	Pedestrian crossing on the major[3] road is controlled by a signal or HAWK			3	
		Uncontrolled pedestrian crossing on the major[3] road			2	
F.	Presence of existing overhead roadway lighting on any Delaware-maintained roadway approach[2]				2	
INTERSECTION SPECIFIC QUESTIONS						
G.	Does intersection have any one of the following:[4] • signalization • mini-roundabout[5] • left turn bays, bypass lanes, and/or right turn lanes • lane drop [i.e. reduction/merge] • medians 6 feet in width or greater				3	

RECOMMENDATION:

Notes:

1. If multiple criteria in section B are met, only the highest point value shall be applied to the total score.
2. The term “approach” means intersection approach, or approach to the unmarked pedestrian crossing.
3. If both intersecting roads of an intersection have the same funcitional classification, the higher AADT roadway should be considered as the "major road" for this calculation.
4. The score met value will be 1 irrespective of how many criteria it satisfied in Item G.
5. A mini-roundabout is defined with an inscribed diameter less than 90 feet. Any roundabout with an inscribed diameter equal to or greater than 90 feet will be defined as a standard sized roundabout and automatically warrant lighting per Section 3.A.2.a.iii.
6. Lighting warrant conditions:
   i. Score less than 10, lighting shouldn't be considered.
   ii. Score between 10-18, further study including crash analysis should be performed in coordination with Chapter 3 of the Traffic Lighting Policy
   iii. Score of 19 and higher should warrant lighting.

APPENDIX W.
TYPICAL AREAS OF ILLUMINATION

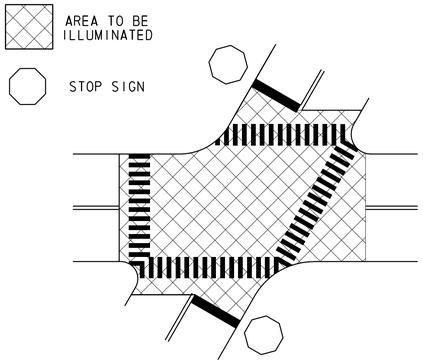


FIGURE 1 : SIMPLE INTERSECTION
MAXIMUM PHOTOMETRIC ZONES: 1

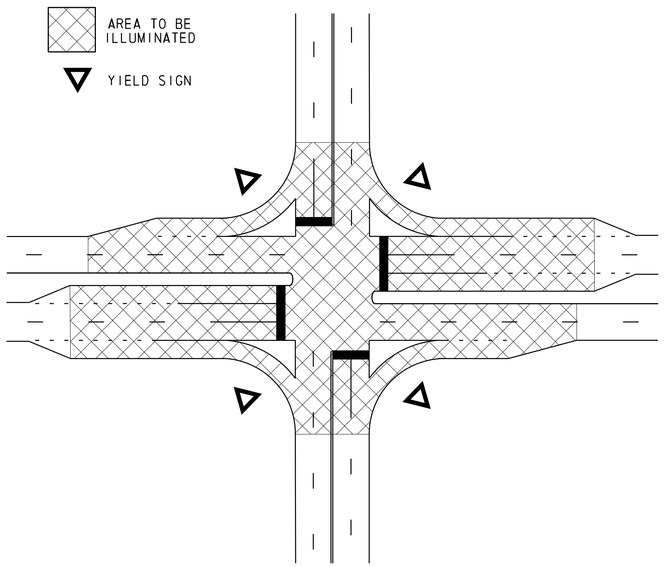


FIGURE 2 : COMPLEX INTERSECTION
MAXIMUM PHOTOMETRIC ZONES: 4

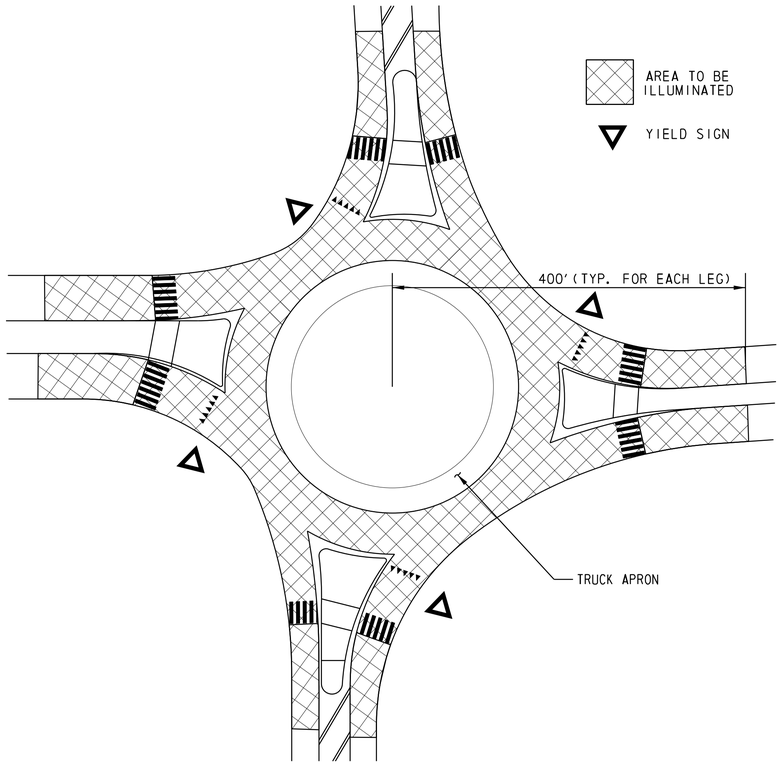


FIGURE 3A : ROUNDABOUT (WITH CROSSINGS)
MAXIMUM PHOTOMETRIC ZONES: 1

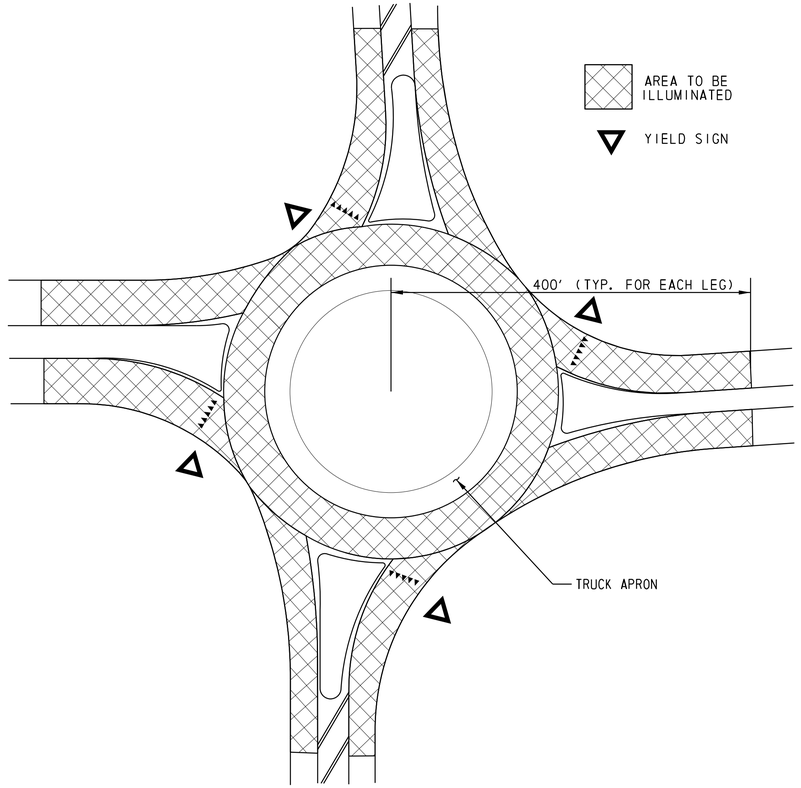


FIGURE 3B : ROUNDABOUT (WITHOUT CROSSINGS)
MAXIMUM PHOTOMETRIC ZONES: 1

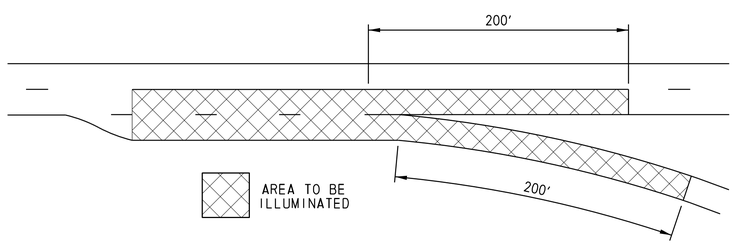


FIGURE 4 : EXIT RAMP AREA, PARTIAL INTERCHANGE LIGHTING
MAXIMUM PHOTOMETRIC ZONES: 2

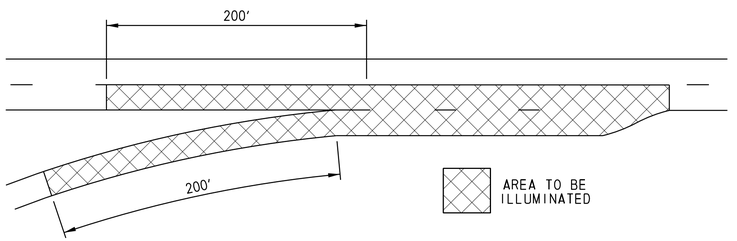


FIGURE 5 : ENTRANCE RAMP AREA, PARTIAL INTERCHANGE LIGHTING
MAXIMUM PHOTOMETRIC ZONES: 2

TYPICAL AREAS OF ILLUMINATION

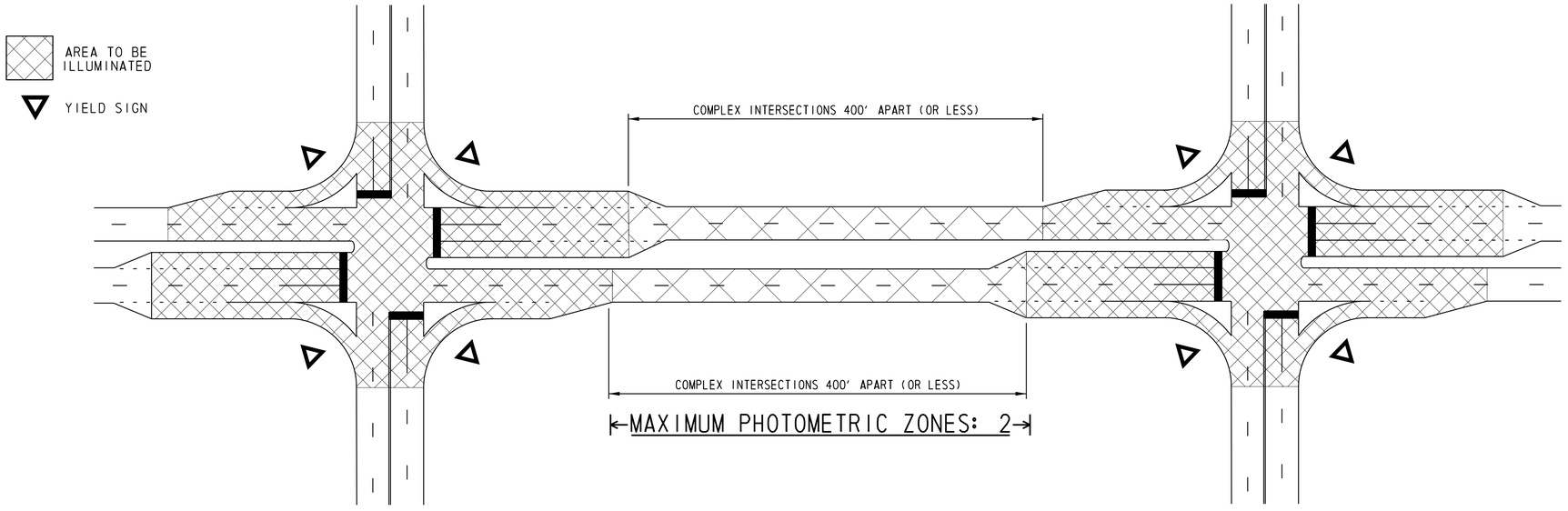


FIGURE 7 : SEGMENT LIGHTING BETWEEN COMPLEX INTERSECTIONS

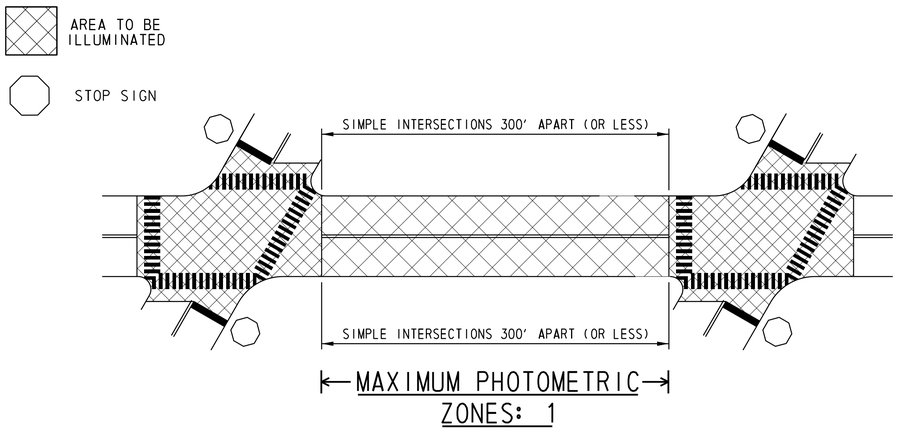


FIGURE 6: SEGMENT LIGHTING BETWEEN SIMPLE INTERSECTIONS

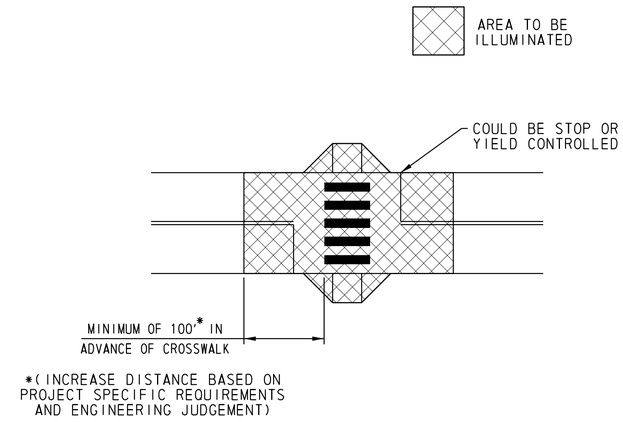


FIGURE 8 : LIGHTING AT MID-BLOCK OR TRAIL CROSSING
MAXIMUM PHOTOMETRIC ZONES: 1

TYPICAL AREAS OF ILLUMINATION

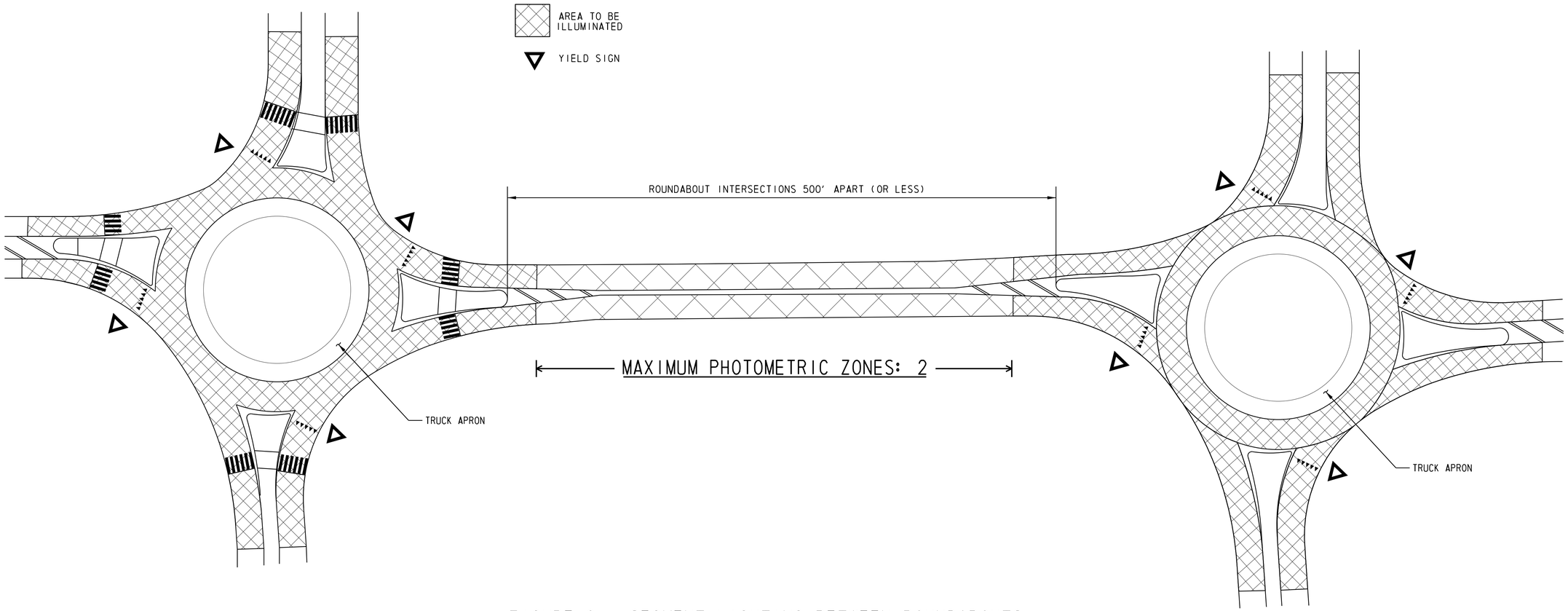
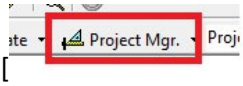


FIGURE 9 : SEGMENT LIGHTING BETWEEN ROUNDABOUTS

TYPICAL AREAS OF ILLUMINATION

APPENDIX X.
GUIDELINES FOR PHOTOMETRIC ANALYSIS:
1. AGI32

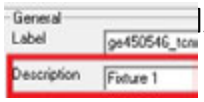
- Create a base file showing:
    - existing and proposed: roadway edges, curbs, medians, structures, barriers, utility poles, electrical features, utility lines, utility structures, signal equipment, right of way, clear zone
    - existing: lights, additional surveyed features,
    - proposed: striping, baseline
- Save your base file in a dwg format
- Open AGI32, and save your new file
- To bring your base file into your new AGI32 file, select 'File', then from drop down select 'Import', then 'CAD file', select your base file, and click 'open', when the 'Import CAD File' pop-up box shows, click the 'Advanced Options' tab, and under 'Advanced Import Options' chance the 'Curve Increment' value to '1' deg., hit 'OK', once the file is imported hit 'OK' again
- If you ever would like to turn off your base file, click on 'Project Manager' along the top of the screen [

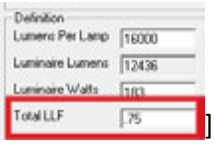
], then to turn off the base you can uncheck the box under 'Enable', click 'OK' to accept
- Some tips for working in AGI32 with DelDOT projects:
    - To turn on/off your snap mode: Un-click the 'Snap' box at bottom-right of screen [

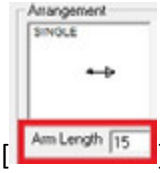
]
- To set up the calculation areas, in the 'Model Toolkit' click on the 'Calculations' tab, then in the 'Add' section click the 'Specify Calculation Points Within a Polygon' button [
], under the 'Point Spacing' section for the 'Left-To-Right' value and the 'Top-To-Bottom' values enter '2' and '2' for intersections, and '5' and '5' for interchanges, change the 'Text Size' to '1', and click 'OK'
- Left click on the first point of the outline of the area you would like to light, and keep clicking around the entire area until your whole section is enclosed; to accept the area when you are done right click
- To remove a section of your calculations area that does not need to be lit (such as a porkchop island, or a median) then under the 'Modify' section click the 'Remove Selected Calculation Points' drop down arrow [

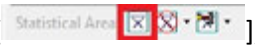
] then select 'Polygon', left click on the first point of the outline of the area you are planning to remove points from, and keep clicking around the entire area until your whole section is enclosed, then right click to accept
- To select a luminaire to test, first go to www.gelightingsolutions.com, click on the 'Products' tab at the top of the page, then in the drop down select 'Outdoor Fixtures' and then 'Roadway'; generally the fixture you are searching for should appear like these:

- Click on one of the fixtures, then under 'Product Downloads' on the right hand side, click 'IES Files', then 'View all files'; based on your needs the fixture should be:
    - Description
        - Light Emitting Diode (LED)
        - 150, 250 or 400 Watts Equivalent
        - 3000K-4000K Color Temperature
        - 1050mA Max Drive Current
    - Distribution
        - Medium (M)
        - Cutoff (C)
        - Type II (2), III (3), or IV (4)
- Once you have selected the fixture you would like to try, click on the file name, then open the file using NotePad, and save it to your computer as an .ies file
- To set up your luminaire fixture in AGI32, select the 'Luminaire' tab, then click the 'Define' button, then click the 'Select' button on the top row, using the folder view locate the .ies file you saved, then click on the file information, and click 'OK', in the 'Smart Symbols' box that pops up, under 'Mounting Type' on the left select the 'Pole' option [

], then click 'OK'
- You will be brought back to the 'Define Luminaire' set-up box, where under the 'General' section you can change the 'Description' of your fixture [

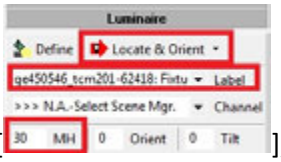
], and under the 'Definition' section 

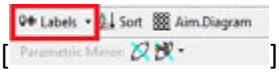
you can change your 'Total LLF' to 0.85*LMF OR use 0.83 if not LMF is given], under the 'Arrangement' section you can change your arm length to any of the varying arm lengths DelDOT uses (8', 12' 15') [

], make sure the 'Lumens Per Lamp' value has been populated, and verify it is typical of the wattage value (on average 150W: 8,000-12,000; 250W: 16,000-20,000; 400W: 27,000-31,000), once all of this information has been entered click 'Add/Redefine' on the right side, then click 'Yes', then 'x' out of the 'Define Luminaire' box
- To create separate statistical areas, click on the 'Calculations' tab, then under the 'Statistical Area' section click the 'Create Statistical Area' button [

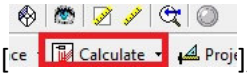
], change the label name of each area you create in the 'General' section under 'Label', make sure your 'Values Type' is set to 'Illuminance', change the size of the text by clicking the 'Labeling' box, and then in the box that pops up under 'Text Size' you can change it to '10' ft then click 'OK', and and click 'OK' again, then left click on the first point of the outline of the area you would like stats on, and keep clicking around the entire area until your whole section is enclosed, then right click to accept, you can move the text of the statistical area by going to the 'Statistical Area' section and

clicking on the 'Edit Statistical Area' button drop down [] and selecting 'Move Label', left click once to select the label to move, then click again to pick a base point, and then click one more time to pick the final location

- Once ready to place your luminaire, under the 'Luminaire' tab, make sure your fixture is selected in the drop down 'Label' and that the MH value is set to the height you would like to mount your fixture at (25' or 30' for utility poles, 30' for light poles at intersections, 40' for light poles at interchanges), and then click 'Locate and Orient' [

], then left click first for the pole base location then left click again once the head of the luminaire is perpendicular to the road at that location, continue placing luminaires as needed, right click to accept once done
- To quickly edit or check the properties of any luminaires, under the 'Luminaire' tab in the 'Modify' section click on the 'Edit Luminaires' drop down arrow and select 'Single' then right click on the luminaire you would like to change, once done right 'OK' to accept any changes
- To add labels to your luminaires to quickly identify them, click on the 'Luminaire' tab, then click on the 'Labels' drop down arrow [

] and select 'Specify Labels', click 'Labels on' and check the boxes for 'Label Insertion Point' and for 'Luminaire Number', 'Label', and 'Switched on/off', change the text size at the bottom to '10' ft, click 'OK'
- To create the template for the luminaire, under the 'Luminaire' tab, within the 'Modify' section click on the 'Create Iso-Illuminance Template' drop down arrow [

], and select 'Create Template', click on the fixture you would like to create a template for, then in the 'Create Template' box that pops up at the bottom under 'Color' select 'Variable', and in the white boxes enter the values and colors of 0.25 (red), 0.5 (orange), 0.75 (yellow), 1 (green), 5 (blue), 10 (purple), then click 'OK'
- To run calculations, click on the 'Calculate' drop down arrow [

], then select 'Direct Only Method', then click 'Calculate', the values should generate and the statistical areas should report your values
- To highlight the maximum and minimum values of a calculation zone after the calculations, under the 'Calculations' tab click on 'Highlight Values' [

], then under the 'Illuminance' tab check the box for 'Highlight Illuminance Values', and check the boxes for 'Maximum' and 'Minimum', or set your own ranges under the 'Value Ranges' section, click 'OK' when complete
- To relocate the luminaire if needed, go to the 'Luminaire' tab, and under the 'Modify' section click the 'Move Luminaire' drop down (green in picture) and select 'Single', left click once to select the luminaire you would like to move, then click again to pick a base point, and then click

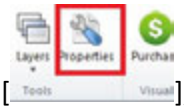
one more time to pick the final location; similar steps will need be taken if you would like to copy a luminaire (yellow), delete a luminaire (red), or re-orient a luminaire (blue), once any luminaire has been changed in any way the calculations will need to be run again

[]

- Once your calculations are complete and you are confident in your design, you can export the file out of AGI32 to upload into your CADD file for design purposes, to do this click on ‘File’, then from the drop down select ‘Export’, and select a location to save it, and determine what format you would like to save it in

APPENDIX X.
GUIDELINES FOR PHOTOMETRIC ANALYSIS:
2. VISUAL

- Create a base file showing:
  - existing and proposed: roadway edges, curbs, medians, structures, barriers, utility poles, electrical features, utility lines, utility structures, signal equipment, right of way, clear zone
  - existing: lights, additional surveyed features,
  - proposed: striping, baseline
- Save your base file in a dxf format
- Open Visual, select 'New Exterior' on the bottom of the startup window, then save your new file as a .VSL file

- To bring your base file into your new Visual file, select 'File' tab, then from drop down select 'Import', select the type of base file you would like to bring in (either CAD, Images, PDF, or Visual file), find the file you would like to import, then click 'Open'
- To setup your standard Visual settings for DelDOT projects
  - To make base file you brought in un-editable: under the 'Home' tab in the 'Tools' section click the 'Properties' button [

], then under 'Object Filters' section uncheck box next to 'Background'
  - To turn off your snap mode: Un-click the 'Snap Mode' box at top of screen []
  - To set the calculation method, click the 'Home' tab, and under the 'Calculations' section select the 'Calculate' drop down, then make sure 'Exterior Lighting', 'Direct Only' and 'Calculate Electrical' are highlighted
- To set up the calculation areas, click on the 'Calculations' tab, then under the 'Calculation Zones' section click 'Polygon', in the 'Calculation Zone' section set your properties:
  - Height: 0
  - Row Spacing/Column Spacing: 2'x2' for intersections, 5'x5' for interchanges
- Left click on the first point of the outline of the area you would like to light, and keep clicking around the entire area until your whole section is enclosed; to accept the area when you are done right click
- To remove a section of your calculations area that does not need to be lit (such as a porkchop island, or a median) then click on the 'Calculations' tab, then under the 'Masking' section click on 'Polygon', left click on the calculation area you are planning to remove points from, then right click to accept, then using left clicks draw your polygon around the area of points you would like to remove, to accept the area when you are done right click
- To create a separate statistical area, click on the 'Calculations' tab, then under the 'Statistical Zones' section click on 'Polygon', left click on the calculation points shape that you are interested in summarizing data for, then right click to accept, then using left clicks draw your polygon around the area of points you would like to summarize information for, to accept the area when you are done right click

- To select a luminaire to test, you first need to determine which vendor you would prefer. For this example, we will be looking at 'Philips' fixtures. First go to www.usa.lighting.philips.com, click on the 'Luminaires & Controls' picture in the middle of the page, then under the 'Outdoor' section on the right, select 'Roadway' fixtures, and following that 'Cobra Heads'. Generally, the type of fixture you are searching for should appear like these:

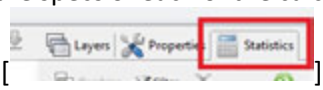
- Click on one of the fixtures (for our example we selected the 'RoadFocus LED Cobra Head – Medium (RFM)'), then click on the 'Downloads' tab, and at the bottom of the screen under 'Photometry/BIM' click 'All IES Files', and you can choose to save the zip file somewhere to your computer. Based on your needs the fixture should be:
    - Light Emitting Diode (LED):
        - Wattage as per the table below:

LED Luminaire: 400 Watt HPS Equivalent		LED Luminaire: 250 Watt HPS Equivalent		LED Luminaire: 150 Watt HPS Equivalent	
Wattage	Lumens	Wattage	Lumens	Wattage	Lumens
250 (Maximum)	27,000-31,000	175 (Maximum)	16,000-20,000	90 (Maximum)	8,000-12,000

With:

- Distribution (MC2, MC3 or MC4)
    - Medium (M)
    - Type 2 (II), 3 (III) or 4 (IV)
- 'BUG' rating
    - B: As per project specifics
    - U: 0
    - G: 0-4, as per project specifics
- Color temperature
    - 3,000K-4,000K

- Once you have selected the fixture you would like to try, open the file with the corresponding name, then always open the file using WordPad/Notepad program. If the file opens in another manner then select all of the text in the file, copy it, and place the text in a new WordPad/Notepad file, then save it to your computer by selecting 'File', then 'Save As', and change the 'Save as Type' to 'All Files (*.*)', and make sure whatever file name you are assigning it has '.ies' at the end (which will save the file in the .ies format that can be recognized by visual).
- To set up your luminaire fixture in Visual, select the 'Luminaire' tab, then under the 'Luminaire' section select 'Schedule', then click on 'New', using the folder view on the left locate the .ies file you saved, then click on the file information, and click 'OK'

- In the 'Luminaire Schedule' you will need to change the 'Light Loss Factor'.
    - For LED fixtures: use a value based on the LLF calculations that were reviewed during the presentation (LLF could be different for every LED fixture). The 'Lumens Per Lamp' value for LED fixtures will be pre-populated, and typically will display as 'Absolute', with no option to be adjusted.
- In the 'Luminaire Schedule' click on the blue 'Edit' box under the 'Symbol' column, then under the '2D Model' tab, in the 'Graphic' section, the 'Configuration' value should be updated to 'Exterior-Single', the 'Pole' box should be checked, the 'Dimensions' should be changed to 1.00 width and 4.00 length, all of the values under the 'Position' section should be 0, the 'Length' value under the 'Support' section could be any of the varying arm lengths DelDOT uses (8', 12' 15'), once all of this information has been entered click 'OK'
- To create the template for the luminaire, in the 'Luminaire Schedule' click on the fixture, then click the 'Templates' icon, in the 'Template' box that pops up, check five of the six boxes that come up, and enter the values and colors of 0.25 (red), 0.5 (orange), 0.75 (yellow), 1 (green), 5 (blue), click the box for 'Apply to All', then click 'OK', then click 'OK' once done in the overall 'Luminaire Schedule'
- Once ready to place your luminaire, under the 'Luminaire' tab, in the 'Luminaire' section, click 'Place and Orient', change the 'Mounting Height' value as needed (~25' for utility poles, 30' for light poles at intersections/roundabouts, 40' for light poles at interchanges), then left click first for the pole base location then left click again once the head of the luminaire is perpendicular to the road at that location, continue placing luminaires as needed, right click to accept once done; make sure your templates are showing by going to 'Luminaire' tab, then making sure the 'Templates' box is clicked under the 'Luminaire' section
- To quickly edit or check the properties of any luminaires, click on the 'Properties' icon, then click on the luminaire head on the plan you are looking at, the properties should pop up in the box on the right, once done right click to close
- To add labels to your luminaires to quickly identify them, click on the 'Luminaire' tab, then click on the 'Labels' drop down under the 'Luminaire' section, and select the preferred label: A-1@10', which would show the Luminaire Type, Number and Mounting Height
- To run calculations, click on the 'Home' tab, then 'Calculate' under the 'Calculation' section. Make sure in the drop down menu 'Exterior Lighting', 'Direct Only' and 'Calculate Electrical' are checked off. To check the specs of each of the calculation zones, click on the 'Statistics' tab on the top right of the screen [

] (ignore any warnings)
- To highlight the maximum and minimum values of a calculation zone after the calculations, select the 'Properties' tab, click on the 'Properties' icon, then left click on the edge of the zone area, on the right should pop up a properties list of that zone, including a section called 'Calculation Points' where you can change the lower and upper limits and the colors they show up as
- To relocate the luminaire if needed, go to the 'Modify' tab, then select 'Move' under the 'Edit' section, then left click on the luminaire you would like to move, then right click to accept, then left click to select the move point, then left click again to move the fixture to the chosen location
- Once your calculations are complete and you are confident in your design, you can export the file out of Visual to upload into your CADD file for design purposes, to do this click on the 'File' tab, then from the drop down select 'Export', then from there select 'CAD Files (DWG, DWF)' and select a location to save it, and determine what format you would like to save it in

Additional Support Information can be found on Visual's website: https://www.visual-3d.com/

APPENDIX Y.
SOIL BORING REQUEST FORM

NOTE: PLEASE CHECK DELDOT'S WEBSITE FOR THE LATEST UPDATES
(https://deldot.gov/Business/drc/index.shtml?dc=bridge#horizontalTab3)

Delaware Department of Transportation
Soil Boring Request Sheet

Contract Information	
Contract Number:	
Contract Name:	
Is this request funded with State or Federal Funds?	

M&R Contact	PD/Bridge Contact
Hany Fekry, PE	Enter Name
Phone: (302)760-2551	Phone: (302)XXX-XXX
Email: hany.fekry@state.de.us	Email: xxx.xxxx@state.de.us

Individual Boring Information - Refer to the Column Headers for Comments Pertaining to Completing This Form

Boring No.	Structure and / or Location Description	Northing	Easting	Total Boring Depth (FT)	AASHTO T206 Continuous Depth / SPT (FT)	Infiltration Test (Y/N)	Coordination (PM/MR)				Notes	Rock Coring (FT)	Structural Related AASHTO Testing				
							Prop. Owner	DNREC	Town	USACE			T288 & T289 pH / Corrosion (Y/N)	T99 or T180 Standard Proctor (Y/N)	T216-07 Consolidation Test (Y/N)	T236 Direct Shear (Y/N)	T297 CU Triaxial (Y/N)

Notes - Enter boring specific notes on individual lines and reference the note(s) in the table above.

Note No.	Note Description
1	
2	
3	
4	
5	
6	

Sheet Last Modified on: December 10th, 2014

APPENDIX Z.
VOLTAGE DROP AND CONDUIT FILL CALCULATION SPREADSHEET (ELECTRONIC SUBMISSION)

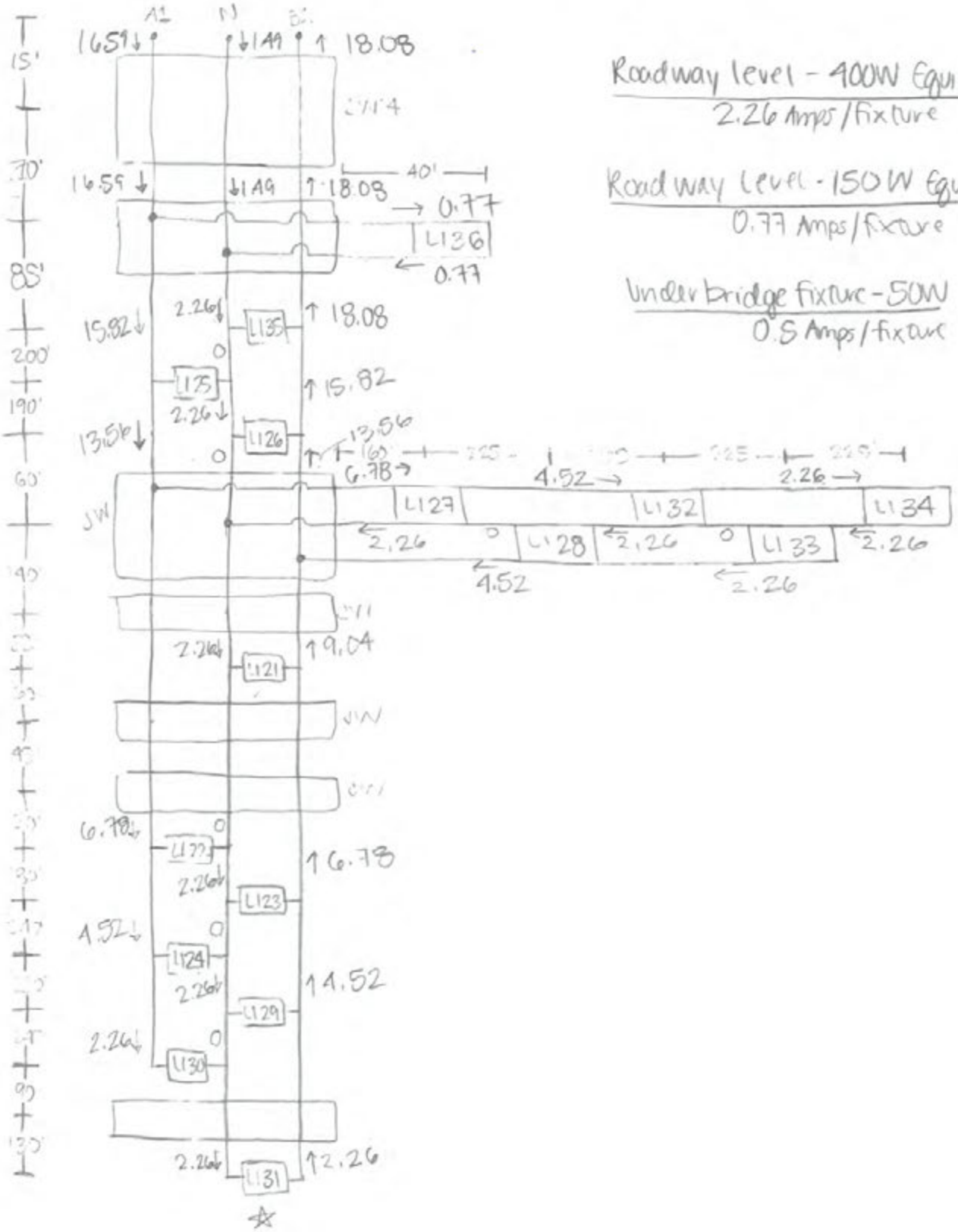
APPENDIX AA.
VOLTAGE DROP HAND CALCULATION SAMPLES

Project Boxwood Road VDrops – T2016060001

Subject Circuit 1 Job No.

Sheet No. 1 of 7

Computed By KAB Date 11/7/17 Checked By GYB Date 1/10/18



Roadway level - 400W Equivalent
2.26 Amps/fixture

Roadway level - 150W Equivalent
0.77 Amps/fixture

Under bridge fixture - 50W
0.5 Amps/fixture

Project Boxwood Road Drops - T201606001

Subject Circuit 1 Job No.

Sheet No. 2 of 7

Computed By KAB Date 11/7/17 Checked By GYB Date 1/10/18

→ B1-N longest

(15')(18.08+1.49)	295
(70')(18.08+1.49)	1365
(85')(18.08+2.26)	1730
(200')(15.82+0)	3165
(195')(15.82+2.26)	3435
(60')(13.56+0)	815
(175')(9.04+2.26)	1980
(125')(6.78+0)	850
(185')(6.78+2.26)	1630
(240')(4.52+0)	1085
(230')(4.52+2.26)	1560
(245')(2.26+0)	555
(220')(2.26+2.26)	995
	19,490 Amp·ft

$$A = \frac{(12.9)(19{,}490)(\quad)}{(0.05)(\quad)} = 46{,}095 \text{ cm}$$

$$\text{Vol\#2} = \left(\frac{46{,}095}{66360}\right) \cdot 0.05 \cdot 120 = 4.17 \text{ A}$$

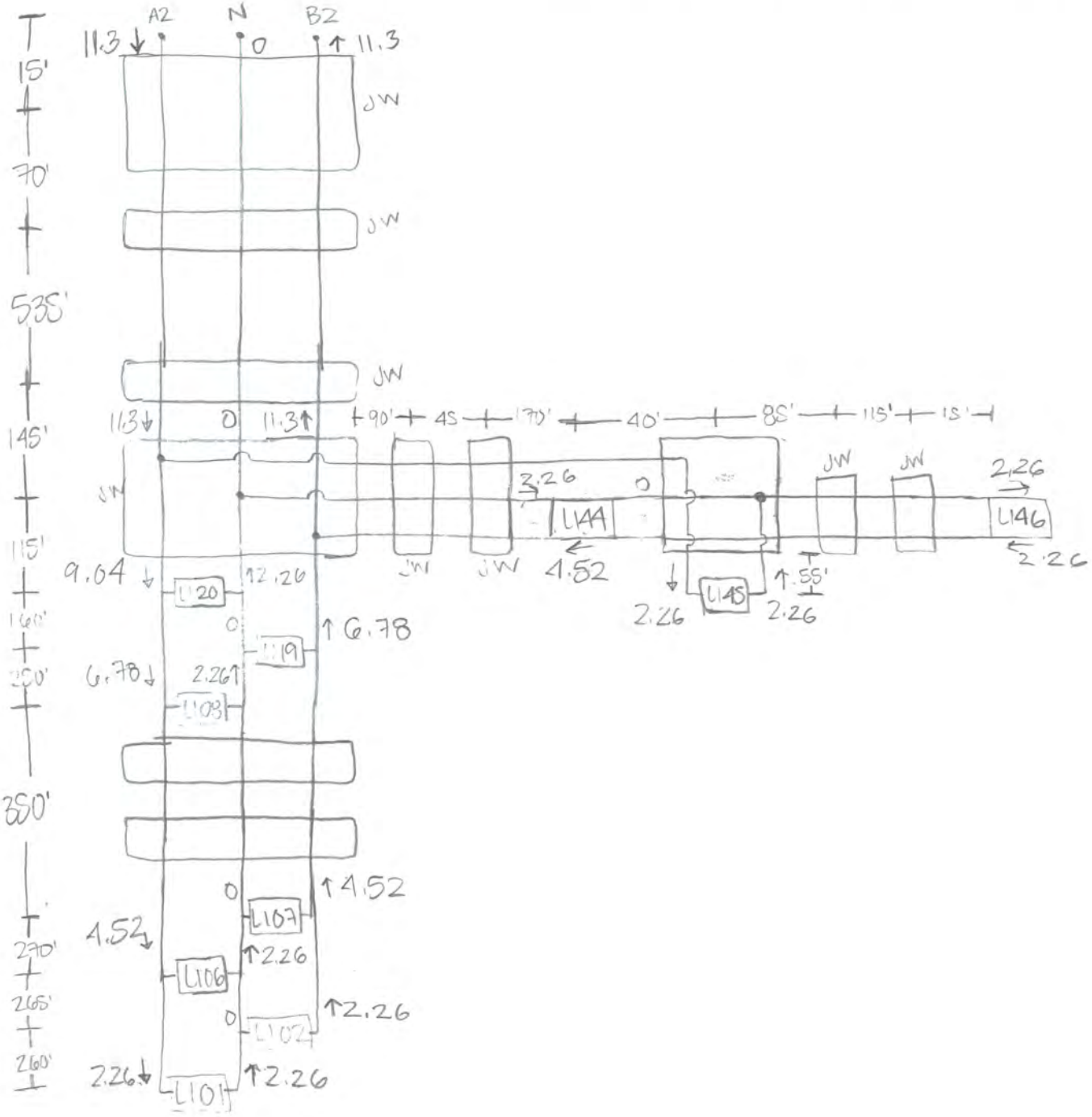
$$\%\ \text{Vol\#2} = \left(\frac{4.17}{6.4}\right) \cdot 100\% = 69.4\ \%$$

Project Boxwood Road VDrops - T201606001

Subject Circuit 2 Job No.

Sheet No. 3 of 7

Computed By KAE Date 11/9/17 Checked By GYB Date 1/10/18



Project Boxwood Road V Drops - T2016060001

Subject Circuit 2 Job No.

Sheet No. 4 of 7

Computed By KAB Date 11/7/17 Checked By GYB Date 1/10/18

→ A2-N longest

= (765')(11.3+0)	8645
(115')(9.04+2.26)	1300
(160')(6.78+0)	1085
(250')(6.78+2.26)	2260
(350')(4.52+0)	1585
(270')(4.52+2.26)	1830
(265')(2.26+0)	600
(260')(2.26+2.26)	1175
	18,480 Amp·ft

$$A = \frac{(12.0)(18{,}480)(1.1)}{(10.55)(2)} = 43{,}705 \text{ cm}$$

$$\text{Vol\#2} = \left(\frac{43{,}705\text{cm}}{66{,}000\text{cm}}\right) \cdot 0.05 \cdot 120 = 3.95 \text{ ft}$$

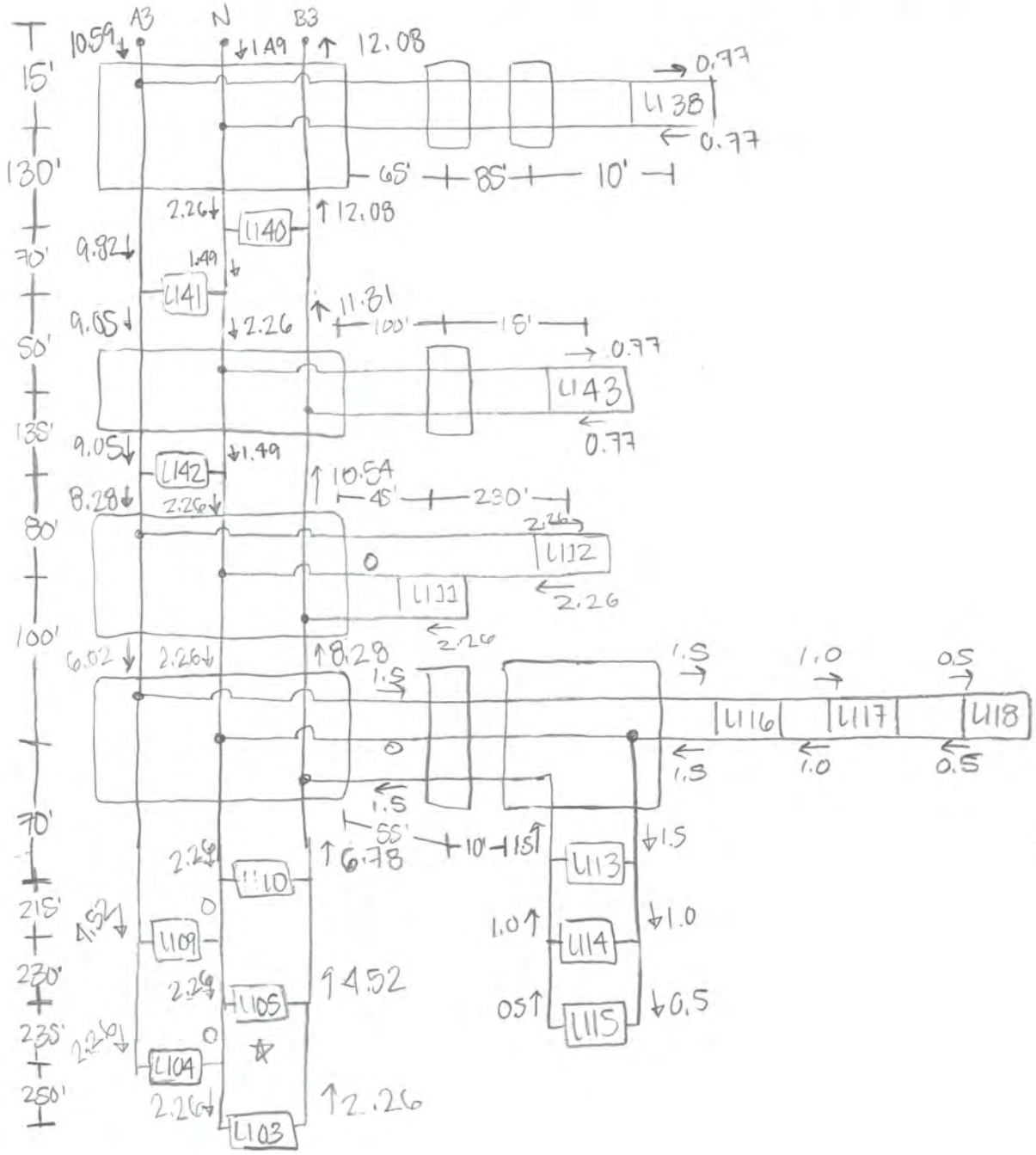
$$\%\ \text{Vol\#2} = \left(\frac{3.95\text{ft}}{6\text{ft}}\right) \cdot 100\% = 65.9\%$$

Project Boxwood Road V Drops - T2016006001

Subject Circuit 3 Job No.

Sheet No. 5 of 7

Computed By KAB Date 11/7/17 Checked By GYB Date 1/10/18



Project Boxwood Road V Drops - T2016006001

Subject Circuit 3 Job No.

Sheet No. 6 of 7

Computed By KAB Date 11/7/17 Checked By GYB Date 1/10/18

B3-N longest

= (15')(12.08+1.49)	205'
(130')(12.08+2.26)	1865'
(70')(11.31+1.49)	900'
(50')(11.31+2.26)	680'
(135')(10.54+1.49)	1625'
(80')(10.54+2.26)	1025
(100')(8.28+2.26)	1055
(70')(6.78+2.26)	635
(215')(4.52+0)	975
(230')(4.52+2.26)	1560
(235')(2.26+0)	535
(250')(2.26+2.26)	1130
	12,190 Amp·Ft

$$A = \frac{(12.9)(12,190)(1.1)}{(10.05)(120)} = 28,830 \text{ cm}$$

$$\text{Vol}_{\#4} = \left(\frac{28,830}{41,740}\right)(0.05)\cdot(120) = 4.14 \text{ V}$$

$$\%\text{ Vol} = \left(\frac{4.14 \text{ V}}{6 \text{ V}}\right)\cdot 100\% = 69\%$$

Project Boxwood Road V Drop - T201606081

Subject _____ Job No. _____

Sheet No. 7 of 7

Computed By KAB Date 11/7/17 Checked By GYB Date 1/10/18

Fill Calcs

CO#10 - (7)#12 = (7)(0.1750) = 1.225 in² → $\left(\frac{1.225}{7.07}\right)$ = 17.3% < 26% ✓
in 3" conduit → (1.5)²·π = 7.07 in²

CO#44 - (4)#2 = (4)(0.1750) = 0.7 in² → $\left(\frac{0.7}{3.14}\right)$ = 22.3% < 26% ✓
in 2" conduit → (1)²·π = 3.14 in²

CO#12 - (8)#4 = (8)(0.1333) = 1.0664 in² → $\left(\frac{1.0664}{7.07}\right)$ = 15.1% < 26% ✓
in 3" conduit → (1.5)²·π = 7.07 in²

Power Source Cable Calcs

A: 16.59 + 11.3 + 10.89 = 38.48 A

B: 18.08 + 11.3 + 12.08 = 41.46 A

N: 1.49 + 0 + 1.49 = 2.98 A

41.46 + 2.98 = 44.44

~95 ft from U.P.

44.44 A · 95 ft = 4225 Amp·ft

$A = \frac{(12.9)(4225)(1.1)}{(0.05)(120)} = 9995$ cm

$Vol_{\#2} = \left(\frac{9995\text{ cm}}{6636.60\text{ cm}}\right) \cdot 0.00 \cdot 120 = 0.90$ V

$\% Vol_{\#2} = \left(\frac{0.90\text{ V}}{6\text{ V}}\right) \cdot 100\% = 15\%$

★ largest cable in the system is #2 AWG.

LIGHTING STANDARD SCHEDULE

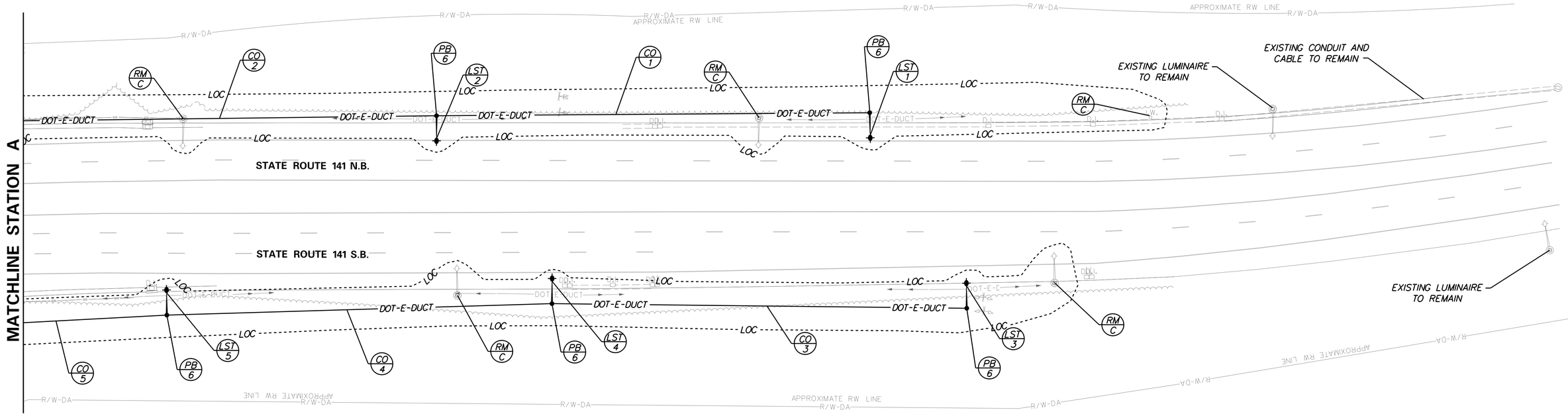
NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	LIGHT DISTRIBUTION
1	A2	627666.9278	600128.6941	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
2	B2	627915.4779	600055.7721	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
3	B3	627579.0030	600032.2722	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
4	A3	627818.2466	599966.7729	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
5	B3	628037.7847	599896.8750	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2

W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM

LIGHTING SERVICE SCHEDULE

CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-1	1	3.0"	260'	T	(2) #2 + (1) #2 GND
CO-2	1	3.0"	265'	T	(3) #2 + (1) #2 GND
CO-3	1	3.0"	250'	T	(2) #4 + (1) #4 GND
CO-4	1	3.0"	235'	T	(3) #4 + (1) #4 GND
CO-5	1	3.0"	235'	T	(3) #4 + (1) #4 GND

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
B = BORE, T = TRENCH, O = OPEN CUT



PLOTTED BY: KBLAKE DATE: 2/21/2018
FILE LOCATION: Q:\NDE\150151_000_TRAFFIC_ENGINEERING_\CADD\202 BOXWOOD INTERCHANGE LIGHTING\LIDGN [SHEET: LI01]

DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE
0 30 60 90
FEET

BOXWOOD ROAD INTERCHANGE
LIGHTING DESIGN

CONTRACT T201701004
COUNTY NEW CASTLE
BRIDGE NO.
DESIGNED BY: KAB
CHECKED BY: GYB

LIGHTING PLAN

LI-01
SHEET NO. 5
TOTAL SHTS. 13

LIGHTING STANDARD SCHEDULE

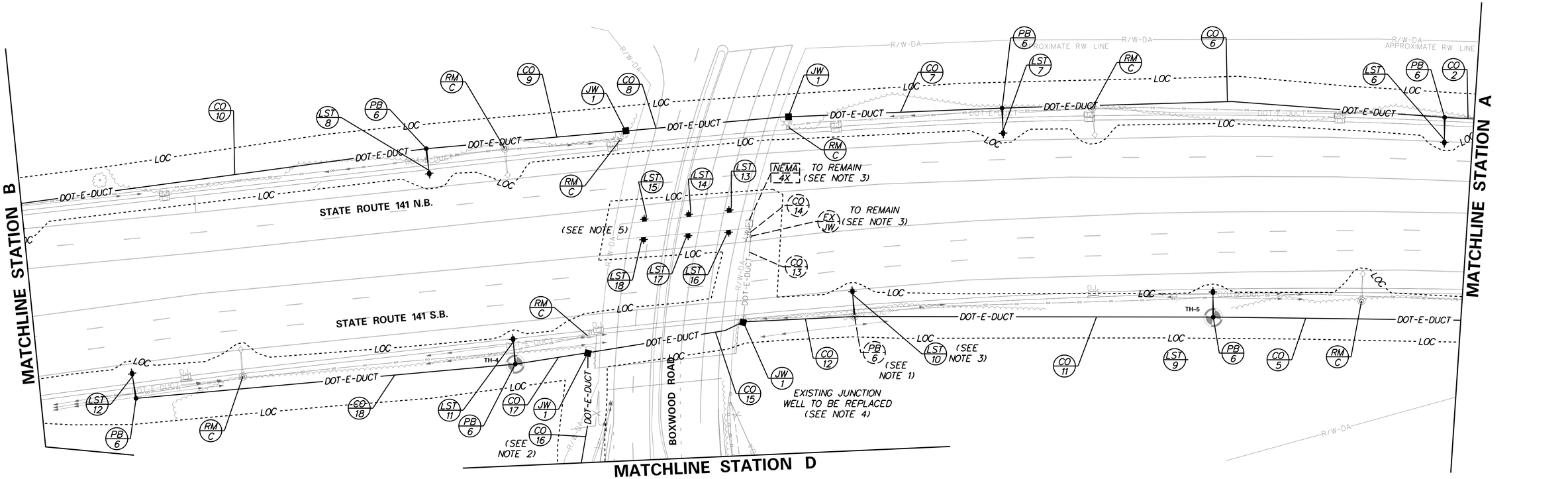
NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	LIGHT DISTRIBUTION
6	A2	628165.7847	599980.8750	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
7	B2	628416.7847	599896.8750	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
8	A2	628732.7883	600052.8761	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
9	A3	628255.7775	599821.8623	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
10	B3	628457.7836	600032.2638	15'	40' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
11	B3	628639.2097	599968.8699	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
12	A3	628845.7847	599896.8750	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
13	B3	REPLACE EXISTING		-	UNDER BRIDGE MOUNTED	N/A	UNDERBRIDGE LED LUMINAIRE	-
14	B3	REPLACE EXISTING		-	UNDER BRIDGE MOUNTED	N/A	UNDERBRIDGE LED LUMINAIRE	-
15	B3	REPLACE EXISTING		-	UNDER BRIDGE MOUNTED	N/A	UNDERBRIDGE LED LUMINAIRE	-
16	A3	REPLACE EXISTING		-	UNDER BRIDGE MOUNTED	N/A	UNDERBRIDGE LED LUMINAIRE	-
17	A3	REPALCE EXISTING		-	UNDER BRIDGE MOUNTED	N/A	UNDERBRIDGE LED LUMINAIRE	-
18	A3	REPLACE EXISTING		-	UNDER BRIDGE MOUNTED	N/A	UNDERBRIDGE LED LUMINAIRE	-

* = EXISITING
W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM

LIGHTING SERVICE SCHEDULE

CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-2	INFORMATION SHOWN ON SHEET LI-01				
CO-5	INFORMATION SHOWN ON SHEET LI-01				
CO-6	1	3.0"	270'	T	(3) #2 + (1) #2 GND
CO-7	1	3.0"	130'	T	(3) #2 + (1) #2 GND
CO-8	1 (SCHD 80 HDPE)	4.0"	100'	B	(3) #2 + (1) #2 GND
CO-9	1	3.0"	120'	T	(3) #2 + (1) #2 GND
CO-10	1	3.0"	250'	T	(3) #2 + (1) #2 GND
CO-11	1	3.0"	215'	T	(3) #4 + (1) #4 GND
CO-12	1	3.0"	70'	T	(6) #4 + (2) #4 GND
*CO-13	1	3.0"	55'	-	NEW [(3) #4 + (1) #4 GND]
*CO-14	1	3.0"	EX.	-	NEW [(3) #4 + (1) #4 GND]
CO-15	1 (SCHD 80 HDPE)	4.0"	95'	B	(3) #4 + (1) #4 GND
CO-16	1 (SCHD 80 HDPE)	3.0"	80'	B	(3) #4 + (1) #4 GND
CO-17	1	3.0"	45'	T	(3) #4 + (1) #4 GND
CO-18	1	3.0"	230'	T	(2) #4 + (1) #4 GND

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
* - EXISTING
B = BORE, T = TRENCH, O = OPEN CUT



NOTES:

1. NEW LIGHT POLE TO BE INSTALLED ON EXISTING LIGHT POLE FOUNDATION.
2. CONDUIT SHALL BE INSTALLED BY BORING TO RUN FROM FROM ONE SIDE OF THE FENCE TO THE OTHER.
3. THE UNDERBRIDGE LIGHTS WILL BE POWERED BY SPLICING THE NEW POWER CABLES IN THE TRANSFORMER BASE OF LIGHT POLE 10. THE SPLICED CABLES WILL THEN RUN FROM LST-10 TO CO-12, THEN WILL UTILIZE EXISTING CONDUITS 13 AND 14 TO RUN THROUGH THE EXISTING JUNCTION WELL IN THE SR 141 SOUTHBOUND SHOULDER UP THE EXISTING CONDUIT IN THE BRIDGE PIER, TO THE EXISTING NEMA BOX MOUNTED IN THE BRIDGE STRUCTURE. THE SPLICING TO THE INDIVIDUAL UNDERBRIDGE MOUNTED LIGHTS WILL OCCUR IN THE BRIDGE MOUNTED NEMA BOX. THE POWER CABLES WILL RUN FROM THE EXISTING NEMA BOX TO THE INDIVIDUAL LIGHTS UTILIZING THE EXISTING CONDUIT LAYOUT WITHIN THE BRIDGE STRUCTURE.
4. THE EXISTING JUNCTION WELL SHOULD BE REPLACED IN THIS LOCATION. LOCATE AND INTERCEPT EXISTING ELECTRIC CONDUIT WITH PROPOSED TYPE 1 JUNCTION WELL.
5. THE EXISTING PHOTOCELL THAT CURRENTLY CONTROLS THE EXISTING UNDERBRIDGE LIGHTS SHALL BE REMOVED AS PART OF THIS PROJECT AS THE NEW LIGHTS WILL BE CONTROLLED VIA A CENTRAL PHOTOCELL ON THE CABINET.

UTILITY TEST HOLE SCHEDULE

NO.	UTILITY	NORTHING	EASTING	GRND EL.	COVER	O.D. & MATERIAL
TH-4	DELDOT	628643.5350	599660.9448	60.62'	2.35'	4" PL. CONDUIT - FIBER OPTIC
TH-5	DELDOT	628260.6258	599833.6769	54.01'	1.55'	4" PL. CONDUIT - FIBER OPTIC

DELAWARE DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE 0 30 60 90 FEET

BOXWOOD ROAD INTERCHANGE LIGHTING DESIGN

CONTRACT T201701004
COUNTY NEW CASTLE
BRIDGE NO.
DESIGNED BY: KAB
CHECKED BY: GYB

LIGHTING PLAN

LI-02
SHEET NO. 6
TOTAL SHTS. 13

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	LIGHT DISTRIBUTION
19	B2	628951.3211	599644.5321	15'	40' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
20	A2	629092.5577	599572.8120	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
21	B1	629221.4805	599511.6352	15'	40' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
22	A1	629311.6582	599557.5811	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
23	B1	629448.3650	599443.9514	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
24	A1	629658.4666	599326.4745	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
25	A1	628902.9457	599456.3799	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
26	B1	629089.2569	599423.6206	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
27	A1	629286.1532	599328.6900	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
28	B1	629485.4554	599231.4668	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2

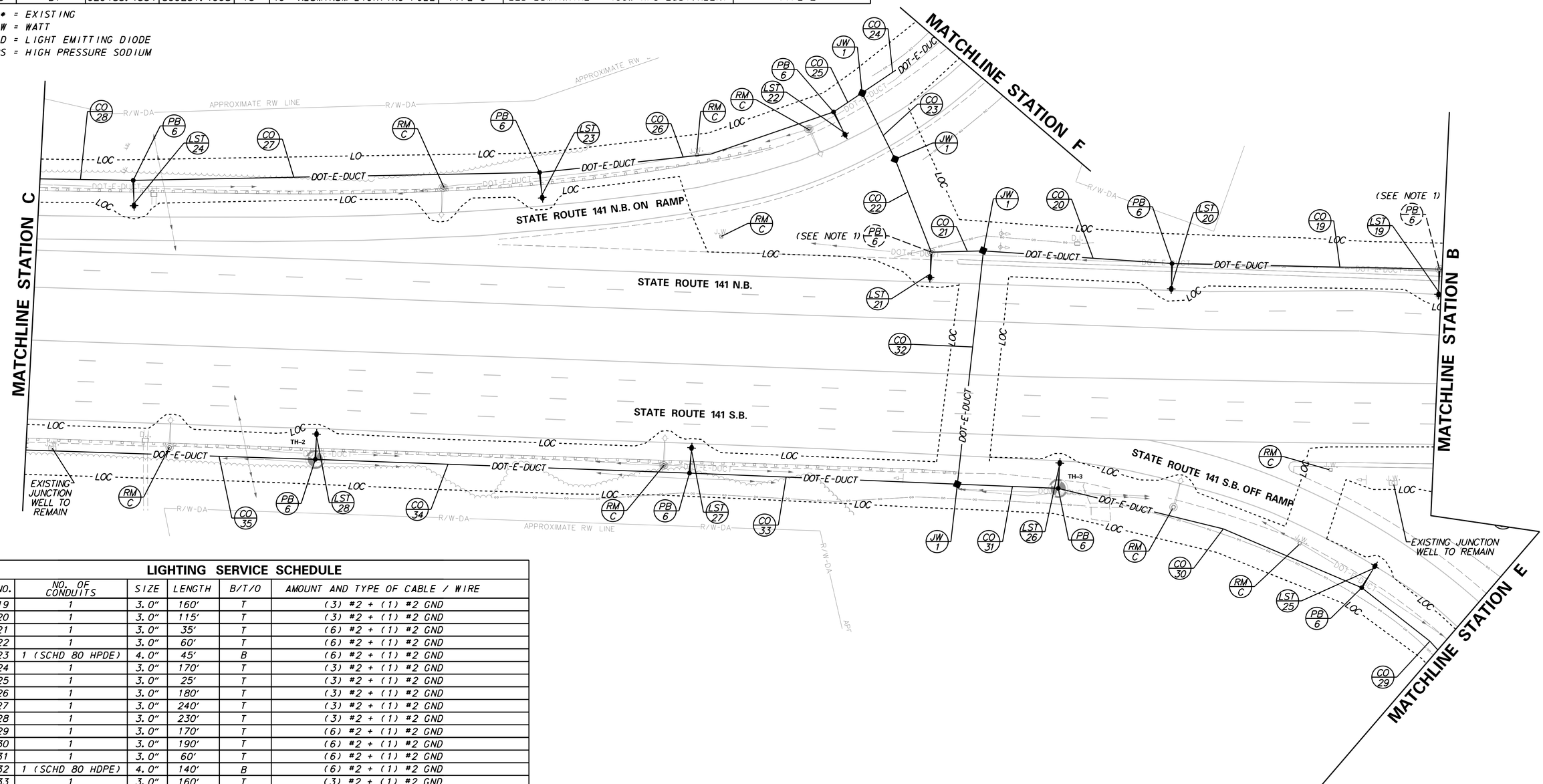
* = EXISTING
W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM

NOTES:
1. NEW LIGHT POLE TO BE INSTALLED ON EXISTING LIGHT POLE FOUNDATION.

N

UTILITY TEST HOLE SCHEDULE

NO.	UTILITY	NORTHING	EASTING	GRND EL.	COVER	O.D. & MATERIAL
TH-2	DELDOT	629483.3170	599230.3658	84.27'	3.59'	4" PL. CONDUIT - FIBER OPTIC
TH-3	DELDOT	629089.3246	599420.7836	72.49'	1.80'	4" PL. CONDUIT - FIBER OPTIC, 2" STL. CONDUIT - DELDOT ELEC.



LIGHTING SERVICE SCHEDULE

CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-19	1	3.0"	160'	T	(3) #2 + (1) #2 GND
CO-20	1	3.0"	115'	T	(3) #2 + (1) #2 GND
CO-21	1	3.0"	35'	T	(6) #2 + (1) #2 GND
CO-22	1	3.0"	60'	T	(6) #2 + (1) #2 GND
CO-23	1 (SCHD 80 HPDE)	4.0"	45'	B	(6) #2 + (1) #2 GND
CO-24	1	3.0"	170'	T	(3) #2 + (1) #2 GND
CO-25	1	3.0"	25'	T	(3) #2 + (1) #2 GND
CO-26	1	3.0"	180'	T	(3) #2 + (1) #2 GND
CO-27	1	3.0"	240'	T	(3) #2 + (1) #2 GND
CO-28	1	3.0"	230'	T	(3) #2 + (1) #2 GND
CO-29	1	3.0"	170'	T	(6) #2 + (1) #2 GND
CO-30	1	3.0"	190'	T	(6) #2 + (1) #2 GND
CO-31	1	3.0"	60'	T	(6) #2 + (1) #2 GND
CO-32	1 (SCHD 80 HDPE)	4.0"	140'	B	(6) #2 + (1) #2 GND
CO-33	1	3.0"	160'	T	(3) #2 + (1) #2 GND
CO-34	1	3.0"	225'	T	(3) #2 + (1) #2 GND
CO-35	1	3.0"	225'	T	(3) #2 + (1) #2 GND

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
B = BORE, T = TRENCH, O = OPEN CUT

DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE
0 30 60 90
FEET

BOXWOOD ROAD INTERCHANGE
LIGHTING DESIGN

CONTRACT T201701004
COUNTY NEW CASTLE
BRIDGE NO.
DESIGNED BY: KAB
CHECKED BY: GYB

LIGHTING PLAN

LI-03
SHEET NO. 7
TOTAL SHTS. 13

LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	LIGHT DISTRIBUTION
29	B1	629862.8345	599221.3749	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
30	A1	630076.8516	599111.2922	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
31	B1	630270.1510	599010.0267	EX.	EX. ALUMINUM LIGHTING POLE	*PARAPET	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
32	A1	629685.3410	599132.8674	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
33	B1	629886.3576	599034.4527	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
34	A1	630088.1122	598935.1299	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2

W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM
* = EXISTING

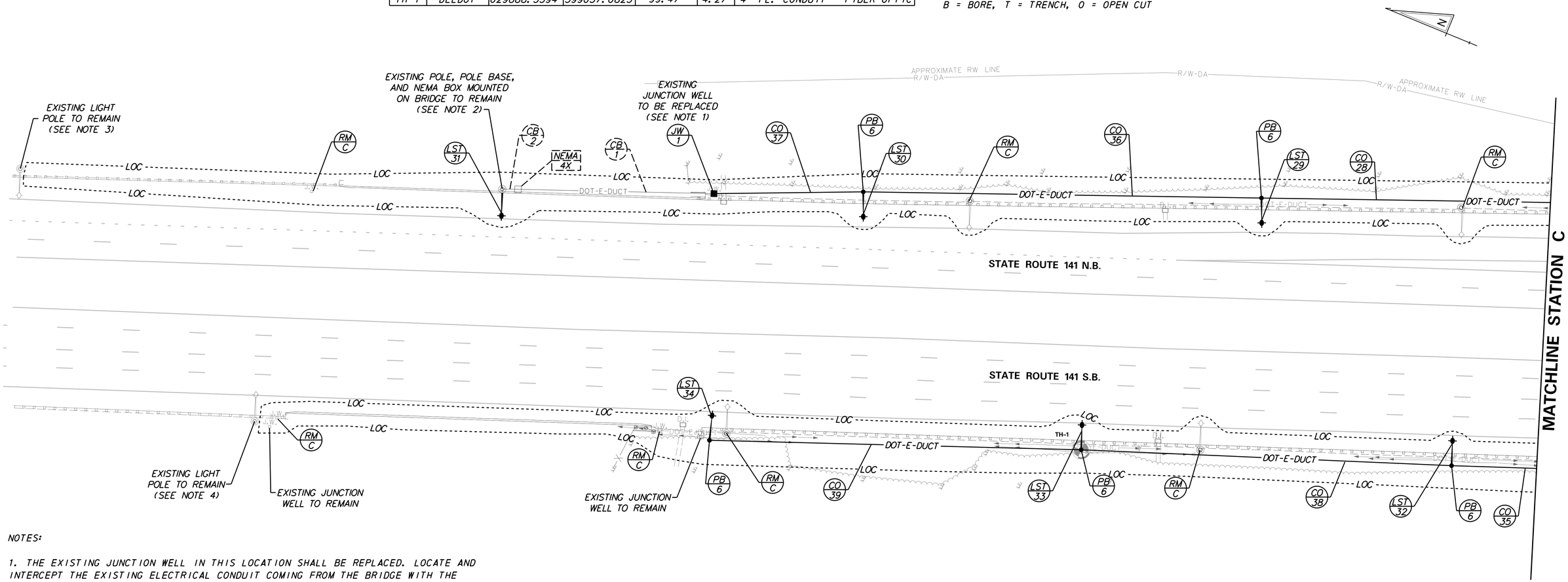
UTILITY TEST HOLE SCHEDULE

NO.	UTILITY	NORTHING	EASTING	GRND EL.	COVER	O.D. & MATERIAL
TH-1	DELDOT	629888.5394	599037.0823	99.47'	4.27'	4" PL. CONDUIT - FIBER OPTIC

LIGHTING SERVICE SCHEDULE

CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-28	INFORMATION SHOWN ON SHEET LI-03				
CO-35	INFORMATION SHOWN ON SHEET LI-03				
CO-36	1	3.0"	245'	T	(3) #2 + (1) #2 GND
CO-37	1	3.0"	90'	T	(2) #2 + (1) #2 GND
CO-38	1	3.0"	225'	T	(3) #2 + (1) #2 GND
CO-39	1	3.0"	225'	T	(2) #2 + (1) #2 GND
*CB-1	1	-	130'	*PARAPET	NEW [(2) #2 + (1) #2 GND]
*CB-2	1	-	5'	*PARAPET	NEW [(2) #2 + (1) #2 GND]

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
* - EXISTING
B = BORE, T = TRENCH, O = OPEN CUT



NOTES:

1. THE EXISTING JUNCTION WELL IN THIS LOCATION SHALL BE REPLACED. LOCATE AND INTERCEPT THE EXISTING ELECTRICAL CONDUIT COMING FROM THE BRIDGE WITH THE PROPOSED TYPE 1 JUNCTION WELL. THE EXISTING CONDUIT RUNNING IN THE BRIDGE STRUCTURE SHALL NOT BE DISTURBED.

2. THE EXISTING LIGHT POLE, POLE CONNECTION TO THE BRIDGE STURCTURE AND NEMA BOX SHALL REMAIN. EXISTING LUMINAIRE SHALL BE RETROFITTED AS PART OF THIS PROJECT. THE EXISTING CONDUIT IN THE BARRIER SHALL REMAIN AND WILL BE USED TO BRING POWER TO THE BRIDGE MOUNTED LIGHT.

3. THE EXISTING LIGHT, LIGHT POLE, AND POLE BASE SHALL REMAIN. THIS LIGHT WILL BE A PART OF THE FUTURE PRICES CORNER LIGHTING SYSTEM. THE EXISTING CABLE RUNNING FROM THE EXISTING LIGHT POLE TO LST-31 SHALL BE REMOVED AS PART OF THIS PROJECT.

4. THE EXISTING LIGHT, LIGHT POLE, AND POLE BASE SHALL REMAIN. THIS LIGHT WILL BE A PART OF THE PRICES CORNER LIGHTING SYSTEM. THE EXISTING CABLE RUNNING FROM THE EXISTING LIGHT POLE TO LST-34 SHALL BE REMOVED AS PART OF THIS PROJECT.

DELAWARE DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE 0 30 60 90 FEET

BOXWOOD ROAD INTERCHANGE LIGHTING DESIGN

CONTRACT T201701004
COUNTY NEW CASTLE
BRIDGE NO.
DESIGNED BY: KAB
CHECKED BY: GYB

LIGHTING PLAN

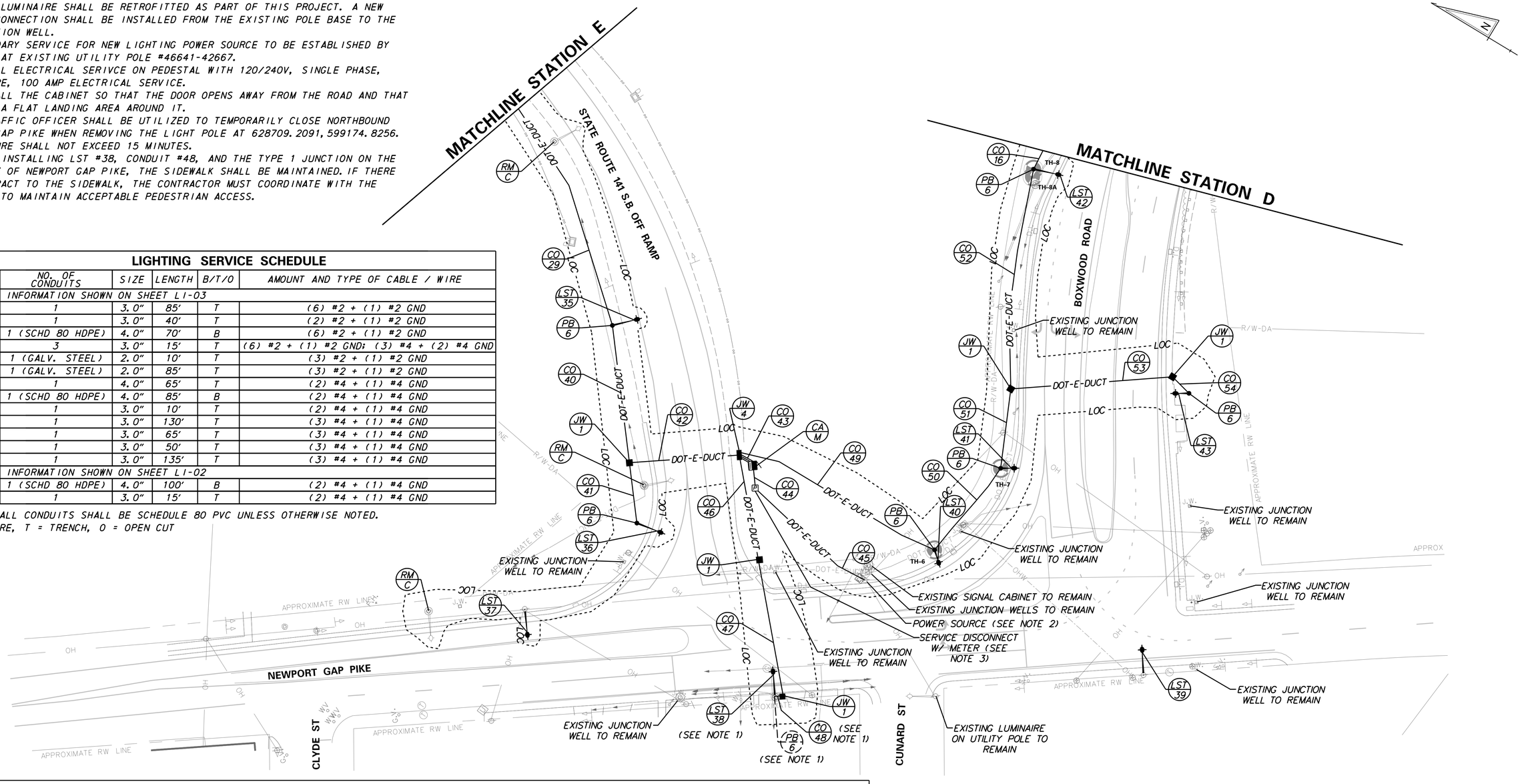
LI-04
SHEET NO. 8
TOTAL SHTS. 13

NOTES:
1. EXISTING LIGHT POLE, POLE BASE, AND TRANSFORMER BASE TO REMAIN. EXISTING LUMINAIRE SHALL BE RETROFITTED AS PART OF THIS PROJECT. A NEW CONDUIT CONNECTION SHALL BE INSTALLED FROM THE EXISTING POLE BASE TO THE NEW JUNCTION WELL.
2. SECONDARY SERVICE FOR NEW LIGHTING POWER SOURCE TO BE ESTABLISHED BY DELMARVA AT EXISTING UTILITY POLE #46641-42667.
3. INSTALL ELECTRICAL SERIVCE ON PEDESTAL WITH 120/240V, SINGLE PHASE, THREE WIRE, 100 AMP ELECTRICAL SERVICE.
4. INSTALL THE CABINET SO THAT THE DOOR OPENS AWAY FROM THE ROAD AND THAT THERE IS A FLAT LANDING AREA AROUND IT.
5. A TRAFFIC OFFICER SHALL BE UTILIZED TO TEMPORARILY CLOSE NORTHBOUND NEWPORT GAP PIKE WHEN REMOVING THE LIGHT POLE AT 628709.2091, 599174.8256. THE CLOSURE SHALL NOT EXCEED 15 MINUTES.
6. WHEN INSTALLING LST #38, CONDUIT #48, AND THE TYPE 1 JUNCTION ON THE WEST SIDE OF NEWPORT GAP PIKE, THE SIDEWALK SHALL BE MAINTAINED. IF THERE IS AN IMPACT TO THE SIDEWALK, THE CONTRACTOR MUST COORDINATE WITH THE ENGINEER TO MAINTAIN ACCEPTABLE PEDESTRIAN ACCESS.

LIGHTING SERVICE SCHEDULE

CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-29	INFORMATION SHOWN ON SHEET LI-03				
CO-40	1	3.0"	85'	T	(6) #2 + (1) #2 GND
CO-41	1	3.0"	40'	T	(2) #2 + (1) #2 GND
CO-42	1 (SCHD 80 HDPE)	4.0"	70'	B	(6) #2 + (1) #2 GND
CO-43	3	3.0"	15'	T	(6) #2 + (1) #2 GND; (3) #4 + (2) #4 GND
CO-44	1 (GALV. STEEL)	2.0"	10'	T	(3) #2 + (1) #2 GND
CO-45	1 (GALV. STEEL)	2.0"	85'	T	(3) #2 + (1) #2 GND
CO-46	1	4.0"	65'	T	(2) #4 + (1) #4 GND
CO-47	1 (SCHD 80 HDPE)	4.0"	85'	B	(2) #4 + (1) #4 GND
CO-48	1	3.0"	10'	T	(2) #4 + (1) #4 GND
CO-49	1	3.0"	130'	T	(3) #4 + (1) #4 GND
CO-50	1	3.0"	65'	T	(3) #4 + (1) #4 GND
CO-51	1	3.0"	50'	T	(3) #4 + (1) #4 GND
CO-52	1	3.0"	135'	T	(3) #4 + (1) #4 GND
CO-16	INFORMATION SHOWN ON SHEET LI-02				
CO-53	1 (SCHD 80 HDPE)	4.0"	100'	B	(2) #4 + (1) #4 GND
CO-54	1	3.0"	15'	T	(2) #4 + (1) #4 GND

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
B = BORE, T = TRENCH, O = OPEN CUT



LIGHTING STANDARD SCHEDULE

NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	LIGHT DISTRIBUTION
35	B1	628723.9398	599375.8728	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
36	A1	628641.7847	599290.8750	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 150W HPS EQUIVALENT	TYPE 2
37	N/A	628664.2693	599210.1803	15'	EXISTING UTILITY POLE	N/A	LED LUMINAIRE - 150W HPS EQUIVALENT	TYPE 2
38	A3	628514.3781	599257.7511	15'	EX. ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 150W HPS EQUIVALENT	TYPE 2
39	N/A	628347.3819	599399.5498	15'	EXISTING UTILITY POLE	N/A	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
40	B3	628491.0819	599384.4249	8'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 150W HPS EQUIVALENT	TYPE 2
41	A3	628488.8426	599446.6456	8'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 150W HPS EQUIVALENT	TYPE 2
42	A3	628579.9473	599600.2346	15'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 150W HPS EQUIVALENT	TYPE 2
43	B3	628426.2733	599549.3969	8'	30' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 150W HPS EQUIVALENT	TYPE 2

* = EXISTING
W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM

UTILITY TEST HOLE SCHEDULE

NO.	UTILITY	NORTHING	EASTING	GRND EL.	COVER	O.D. & MATERIAL
TH-6	DELDOT	628493.6820	599384.4700	73.11'	2.75'	2 3/4" STL. CONDUIT - ELECTRIC
TH-7	DELDOT	628485.4845	599446.2913	74.42'	2.35'	3" STL. CONDUIT - ELECTRIC
TH-8	DP-E	628576.4495	599602.4120	74.89'	5.49'	48" w/ RPC CAP OVER ELECTRIC DUCT
*TH-8A	DP-E	628574.5001	599602.2577	74.84'	5.50'	RPC CAP OVER ELECTRIC DUCT

* DUE TO THE SIZE OF THE RPC CAP, A SECOND HOLE WAS REQUIRED TO FULLY EXPOSE STRUCTURE

DELAWARE DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE 0 30 60 90 FEET

BOXWOOD ROAD INTERCHANGE LIGHTING DESIGN

CONTRACT T201701004
COUNTY NEW CASTLE
BRIDGE NO.
DESIGNED BY: KAB
CHECKED BY: GYB

LIGHTING PLAN

SHEET NO. 9
TOTAL SHTS. 13

PLOTTED BY: KBLAKE DATE: 2/22/2018
FILE LOCATION: Q:\NDE\150151_000_TRAFFIC_ENGINEERING_\CADD\202 BOXWOOD INTERCHANGE LIGHTING\LI.DGN [SHEET: LI01]

LIGHTING STANDARD SCHEDULE

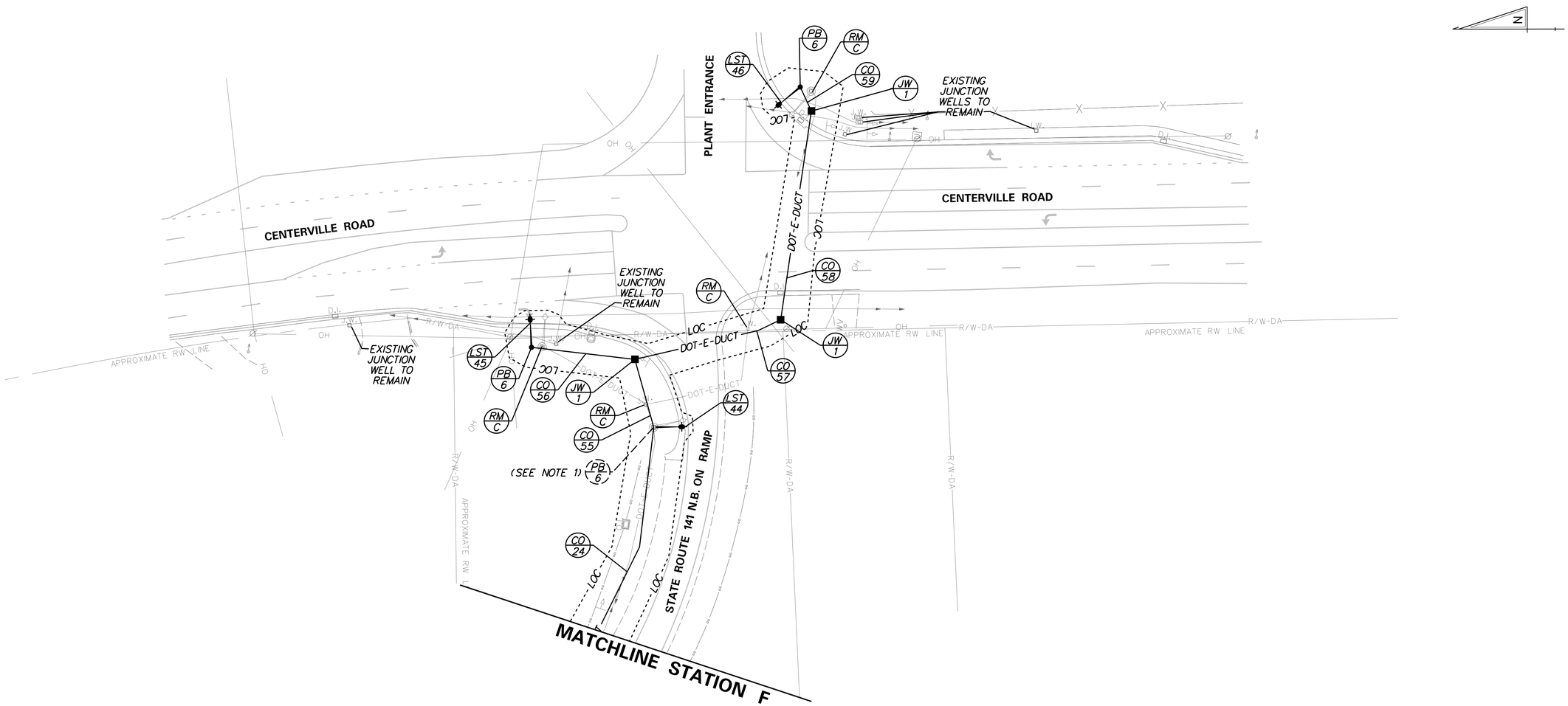
NO.	CIRCUIT NO.	NORTHING	EASTING	ARM	LIGHT STANDARD	POLE BASE	LUMINAIRE	LIGHT DISTRIBUTION
44	B2	629259.6070	599736.2860	15'	40' ALUMINUM LIGHTING POLE	*TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
45	A2	629329.0986	599772.3684	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2
46	B2	629199.7847	599925.8750	15'	40' ALUMINUM LIGHTING POLE	TYPE 6	LED LUMINAIRE - 400W HPS EQUIVALENT	TYPE 2

* = EXISTING
W = WATT
LED = LIGHT EMITTING DIODE
HPS = HIGH PRESSURE SODIUM

LIGHTING SERVICE SCHEDULE

CO NO.	NO. OF CONDUITS	SIZE	LENGTH	B/T/O	AMOUNT AND TYPE OF CABLE / WIRE
CO-24	INFORMATION SHOWN ON SHEET LI-03				
CO-55	1	3.0"	40'	T	(3) #2 + (1) #2 GND
CO-56	1	3.0"	60'	T	(2) #2 + (1) #2 GND
CO-57	1 (SCHD 80 HDPE)	4.0"	85'	B	(2) #2 + (1) #2 GND
CO-58	1 (SCHD 80 HDPE)	4.0"	115'	B	(2) #2 + (1) #2 GND
CO-59	1	3.0"	15'	T	(2) #2 + (1) #2 GND

NOTE: ALL CONDUITS SHALL BE SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.
B = BORE, T = TRENCH, O = OPEN CUT



NOTES:
1. NEW LIGHT POLE TO BE INSTALLED ON EXISTING LIGHT POLE FOUNDATION.

DELAWARE DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

SCALE 0 30 60 90 FEET

BOXWOOD ROAD INTERCHANGE LIGHTING DESIGN

CONTRACT T201701004
COUNTY NEW CASTLE
BRIDGE NO.
DESIGNED BY: KAB
CHECKED BY: GYB

LIGHTING PLAN

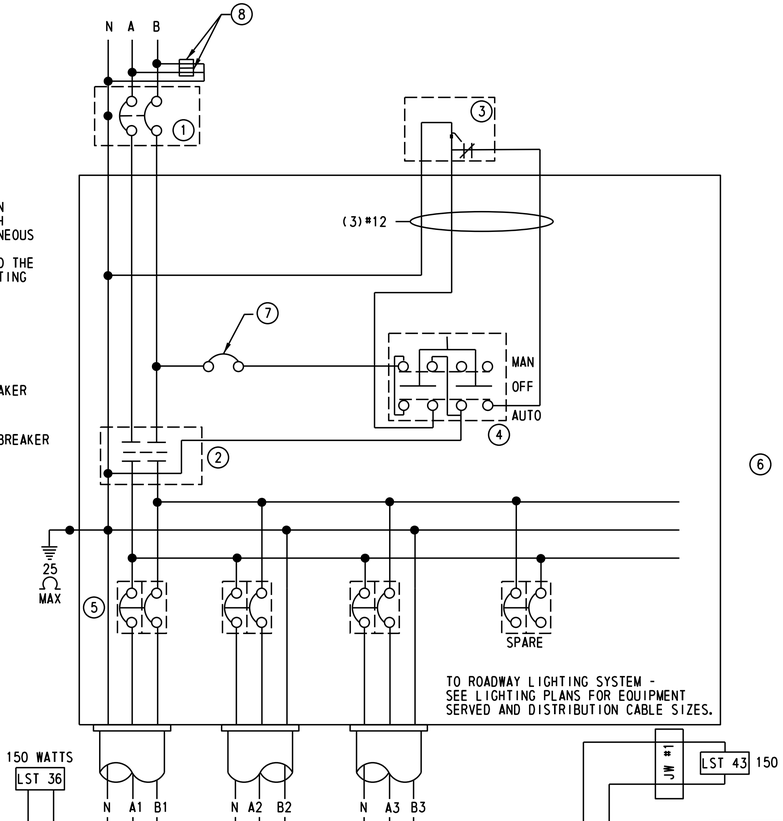
LI-06
SHEET NO. 10
TOTAL SHTS. 13

PROPOSED LOAD CENTER CABINET
SCHEMATIC WIRING DIAGRAM POWERING
PROPOSED LIGHTS #1-#36, #38, AND #40-#46
(POWER SOURCE #1)

N.T.S.

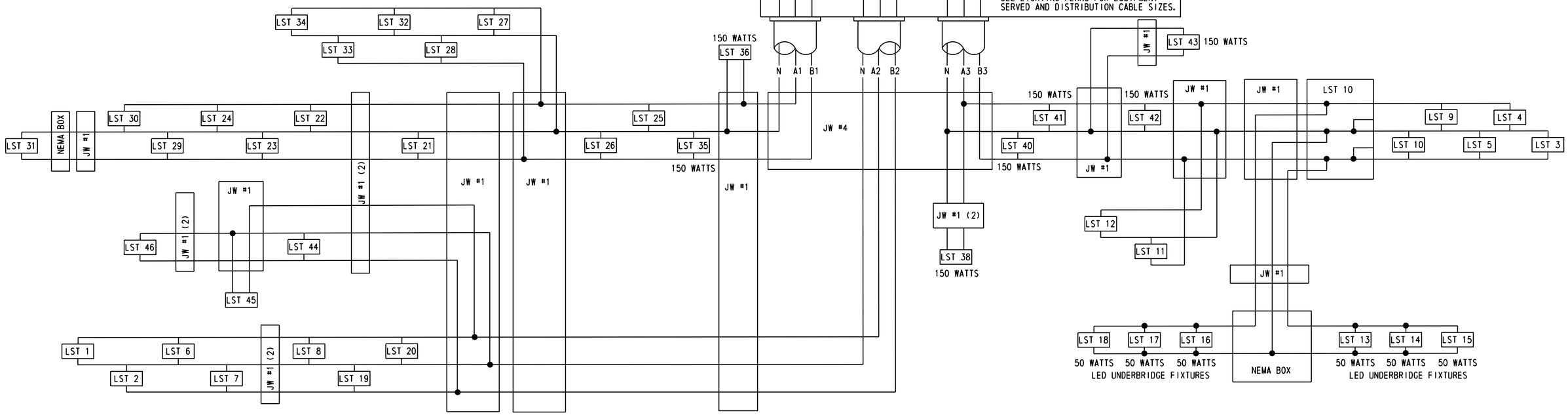
NOTE: ALL FIXTURES ARE 400W HPS EQUIVALENT LED, EXCEPT WHERE NOTED.

N NEUTRAL
A LINE 1
B LINE 2
(1) 100 AMP, 2 POLE MAIN CIRCUIT BREAKER WITH ADJUSTABLE INSTANTANEOUS SETTING IN NEMA 4X ENCLOSURE MOUNTED TO THE OUTSIDE OF THE LIGHTING CONTROL CABINET
(2) 100 AMP CONTACTOR
(3) PHOTOELECTRIC CELL
(4) SELECTOR SWITCH
(5) 25 AMP TWO POLE BREAKER
(6) CONTROL CABINET
(7) 15 AMP SINGLE POLE BREAKER
(8) LIGHTING ARRESTOR



THERE SHOULD BE A LABEL INSIDE THE CABINET TO INDENTIFY WHICH LIGHT POLES ARE ON EACH CIRCUIT.

CIRCUIT	LIGHTS
A1	22, 24, 25, 27, 30, 32, 34
B1	21, 23, 26, 28, 29, 31, 33, 35
A2	1, 6, 8, 20, 22, 45
B2	2, 7, 19, 44, 46
A3	4, 9, 12, 16, 17, 18, 38, 41, 42
B3	3, 5, 10, 11, 13, 14, 15, 40, 43



DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS

NOT TO SCALE

BOXWOOD ROAD INTERCHANGE
LIGHTING DESIGN

CONTRACT	BRIDGE NO.
T201701004	
COUNTY	DESIGNED BY: KAB
NEW CASTLE	CHECKED BY: GYB

LIGHTING DETAIL

SHEET NO.
11
TOTAL SHTS.
13

APPENDIX BB.
UTILITY CONTACT INFORMATION

Utility Contact Information

Electrical Utility Companies:

- **Delmarva Power**:
  - Address: 500 North Wakefield Drive, Newark, DE 19702
  - Mailing Address: P.O. Box 231, Wilmington, DE 19899-0231
  - Phone: 1-800-375-7117
  - Website: https://www.delmarva.com/Pages/default.aspx
  - Electric Service: https://www.delmarva.com/MyAccount/MyService/Pages/ConstructionRemodeling.aspx
  - Tariff Lighting: https://www.delmarva.com/MyAccount/MyBillUsage/Pages/DE/Electric/CurrentTariffs.aspx

- **Delaware Electric Cooperative (DEC)**:
  - Address: 14198 Sussex Highway, Greenwood, DE 19950
  - Mailing Address: P.O. Box 600, Greenwood, DE 19950
  - Phone: 1-855-332-9090
  - Website: https://www.delaware.coop/
  - Electric Service: https://www.delaware.coop/form/member-services/builder-new-services
  - Tariff Lighting: https://www.delaware.coop/form/member-services/security-lights

Local City/Town Utilities:

- **City of Dover – Electrical Department:** (302) 736-7091
- **City of Lewes – Public Works Department:** (302) 645-6228
- **City of Newark – Electrical Department:** (302) 366-7050
- **Town of Middletown – Public Works Department:** (302) 378-2211
- **City of Milford – Electrical Department:** (302) 422-1110
- **City of Seaford – Public Works Department:** (302) 629-8307
- **Town of Smyrna – Electrical Department:** (302) 653-3493

APPENDIX CC.
DGM 1-27 – ‘ELECTRIC POWER SERVICE REQUEST FOR ROADWAY LIGHTING, TRAFFIC SIGNALS AND ITS EQUIPMENT’

Delaware Department of Transportation
Division of Transportation Solutions
Design Guidance Memorandum

Memorandum Number: 1-27

1. Road Design Manual
2. Bridge Design Manual
3. Utilities Design Manual
4. Right of Way Manual
5. Standard Specifications
6. Standard Construction Details
7. Traffic Design Manual

Title: Electric Power Service Request for Roadway Lighting, Traffic Signals and ITS Equipment
Effective Date: 4-07-2020

Sections to Implement:

_X_ Project Development	_X_ Planning	____ DTC
_X_ Bridge	____ Quality	_X_ Traffic
_X_ Team Support	_X_ Maintenance & Operations	____ Other
_X_ Utilities		

I. Purpose

To establish the procedures for processing the request for new electric power service for any DelDOT roadway lighting, traffic signal and/or ITS equipment as part of any new construction, or repair/upgrades to existing roadways on public use facilities.

II. Applicability

DelDOT recognizes the benefits of streamlining the electrical power needs across multiple sections within the Department to account for the type, size, location, maintenance responsibility, monthly billing arrangements, and installation cost specific to each project. This guidance only applies to Capital projects. Traffic led projects, projects involving construction of buildings, tariff based (i.e. utility owned) lighting on Capital projects, and any other projects will be addressed separately.

III. Design Guidance

1. For Capital Projects the 'designer' will identify power supply needs for roadway appurtenances (typically roadway lighting, traffic signals, and ITS devices) as early in the design phase as possible. For consultant led Capital projects, the designer will be the consultant's engineer whereas for internal DelDOT led Capital projects, the designer will be DelDOT's assigned traffic engineer within Traffic's System Design Section.
2. The designer should coordinate with DelDOT's Project Development (PD)/Bridge or Planning Project Manager, Traffic Section, and Utility Section regarding power source needs. The designer shall arrange a field meeting with the utility company to determine the power needs, location of the power source, type of power, cost to the department, and whether service will be metered or tariff. DelDOT's Project Manager and Utility Engineer will attend the field meeting, as necessary. However, if the highway design is led by PD then their highway designer should attend the field meeting as well. Additional support is available to the designer working with the utility company via DelDOT's monthly utility coordination meetings.
3. DelDOT Project Manager, Utility Engineer, and Traffic System Design Manager will coordinate to determine whether there is any reimbursable utility work on the project. If there is any reimbursable utility work, DelDOT Utility Section will request a cost estimate from the utility company for the installation of new power source. If there is no reimbursable

utility work associated with the Capital Project, then the cost estimate for power source will be obtained by the designer in coordination with the Utility Section and provided to the Traffic Section to be added to the traffic statement.

4. After the designer and utility company representatives have agreed upon the power source location, the designer is responsible to properly display the necessary information on the project plans and provide the plans to DelDOT's Project Manager, Traffic System Design Manager, and Utility Section. Additionally, the utility statement for the project should incorporate the power source and other relevant information. In the case of lighting design, the location of utility pole-based tariff lighting should also be provided on the utility statement.
5. If there are multiple power source requests in a project area, the utility company may request a gang meter where one combined meter setup with separate billing can be accommodated for multiple service requests (i.e. signals, ITS, lighting). In such case, the designer shall coordinate with DelDOT Traffic Signal Construction group and utility company for the feasibility of a gang meter (cluster of meters with a single power source) in their project assuming that voltage drops will not be an issue.
6. The utility statement shall provide the description of the work and identify the responsible parties for installation of the work associated with the provision of new electrical service. The utility statement should also identify responsibility of payment for installation of power service (whether by DelDOT Utility Section or Traffic Section) and parties responsible for payment of usage of service. If applicable, the utility statement should also provide information on gang meter and the type of services connected there.
7. DelDOT Utility Section will fund the power service work if there is any reimbursable work for utility relocation. If there is no reimbursable utility work, then DelDOT Traffic Section will address the funding need of the work through the traffic statement. Utility Engineer will support the Traffic Section, as necessary. A utility bar chart, showing the work schedule shall be prepared by the designer in coordination with the Utility section and the power company to show the timing of the power supply work and included in the Utility Statement.
8. DelDOT's Traffic Signal Construction group will be responsible for the preparation and delivery of the power service application with the support of the designer. Traffic personnel handling these requests can be confirmed through the Traffic Field Operations. For projects where there are more than two power service requests, a display map showing all the power source locations and the type of services should be provided by the designer and will be part of the power service application. A copy of the Utility Statement and power service application shall be sent to Traffic, the M&O Districts and Business Management at the time of PS&E.
9. The timing of the electric service processing, including when the service application will be submitted, should be discussed at the pre-con meeting. If the utility company isn't present at the pre-con meeting, then a separate meeting should be arranged soon after the pre-con meeting. That meeting will ensure (to the extent possible) that DelDOT Construction group, Traffic Signal Construction group, and the utility company are in agreement for the utility service schedule. However, no major utility change that may trigger any redesign of the Roadway Lighting, Traffic Signals, or ITS Equipment should be considered after PS&E. DelDOT Utility Section, designer, and others will assist the meeting, as necessary. The final Utility Statement and the power service application shall be sent to the utility company at the agreed upon time as determined during the meeting.
10. Once funding is setup and a Purchase Order established, the DelDOT Utility Section or Traffic Section will issue a Notice to Proceed (NTP) to the utility company who will be completing the power supply work. The NTP will authorize the utility company to order the necessary materials and to coordinate with DelDOT Construction (i.e. Construction) as to initiating work on the project site.
11. Utility company will coordinate the timing of the power service work with Construction Section and complete the work. If the NTP is issued by Traffic Finance Section, then the

utility company will submit the invoice to the Construction Section. However, if the NTP is issued by the Utility Section then the invoice will be submitted to the Utility Section who will review it and then forward to the Construction Section.

12. The Construction Section will review and confirm the quantities of power service work listed in the invoice and forward to the Utility Section for payment for reimbursable utility work. For non-reimbursable utility work, Construction Section will forward the invoice to Traffic Finance Section for payment. DelDOT Utility Section or Traffic Section will pay the invoice based on the type of work.
13. Bills for electric power usage will be sent to and paid by the appropriate Division/ Section as identified on the power service application form. This is typically the Business Management Section in the Division of Maintenance & Operations for lighting and the Traffic Section in the Division of Transportation Solutions for signals, ITS, and any other traffic devices.

IV. Justification

In order to promote efficiency and effective project delivery.

Prepared by: Traffic Engineering Section — Date: April 07, 2020

Peter Haag DelDOT — 4/8/2020

Recommended by: Chief of Traffic Engineering — Date

04/08/2020

Reviewed by: Deputy Director - Design — Date

4/8/2020

Approved: Chief Engineer — Date

Distribution:
Transportation Solutions
Utilities
Maintenance & Operations District Engineers
Consultants
DOT Internal Site

ELECTRIC POWER SERVICE REQUEST FOR ROADWAY LIGHTING, TRAFFIC SIGNALS, AND ITS EQUIPMENT FOR CAPITAL PROJECTS

Designer to identify power supply needs and coordinate with PM, Traffic Section and Utility Section.

- Designer could be consultant's engineer or DelDOT traffic engineer based on whether the design will be done in-house or by a consultant.

Designer shall arrange a field meeting with Utility Company to determine power needs, location of power source, type of power, cost to DelDOT, and type of lighting service (tariff or standalone pole).

- If PD is doing the highway design, then the PD highway engineer should attend field meeting as well.

DelDOT PM, Utility Coordinator and Traffic Systems Design Manager will determine if there is any reimbursable utility work on the project.

- YES: Utility Section will request cost estimate from Utility Company.
- NO: Designer will obtain cost estimate from Utility Company in coordination with the Utility Section, and add to Traffic Statement.

Designer is responsible to properly display the necessary information on the project plans. Utility Statement should incorporate power source and other relevant information.

- Utility Statement will identify the responsibility of payment either by Utility Section or by Traffic Section.

Final Utility Statement and power service application form shall be sent to the Utility Company at the time of project PS&E. Signal Construction will prepare the power service application form and submit to the Utility Company.

- A copy of the application will be sent to M&O Districts and Business Management at the same time.
- For projects with more than two power service requests, designer will prepare a display map showing all the power locations which will be submitted with the applications.

Utility Section or Traffic Section will issue NTP depending on the type of work (reimbursable or non-reimbursable). Utility Company will coordinate with Construction Section to complete the work.

- If Traffic Section assigned NTP then Utility Company will send invoice directly to DelDOT Construction.
- If Utility Section assigned NTP then the invoice will go to Utility Section and they will send it to DelDOT Construction Area Engineer.

DelDOT Construction will review the invoice and forward to appropriate section for payment. Utility Section or Traffic Section will pay the invoice based on the type of work.

- Bills for electric power usage will be sent to and paid by the appropriate division/section as identified on the power service application form.

APPENDIX DD.
DELDOT APPLICATION FOR POWER SERVICE

Delaware Department of Transportation
Signal Construction – Traffic Section
800 Bay Road
Dover, DE 19901
(302) 659-4067 Billing Office
(302) 739-5499 Fax

APPLICATION FOR TRAFFIC SIGNAL, LIGHTING OR ITMS DEVICES

Electric Company (please specify): _____ Elec. Co. Contact Person:_____

Location of Service:_____ **Permit #:**_____
(Intersection, street name, etc.)

Account Number (Please specify if available):_____

Applications for (please check appropriately):

☐ Traffic Signal ☐ Lighting ☐ ITMS Device (specify: _____)

Please send bills to the appropriate location:
☐ Traffic Signal: DelDOT – Traffic, 169 Brick Store Landing Road, Smyrna, DE 19977
☐ ITMS Device: DelDOT – Traffic, 169 Brick Store Landing Road, Smyrna, DE 19977
☐ Lighting: DelDOT – M&O, ATTN: Lighting, 800 Bay Road, Dover, DE 19901

Type of Service:
☐ **New Service Location** (Voltage _____) (Total kW_____)

☐ **Conversion of Existing Service** – Changing service from "unmetered" service to "metered" service
(Please indicate which tariff account for the removal. List bulb removals on page 2. Include new voltage and kW and new meter number, if available.)
- ☐ Delmarva tariff New Castle County – 55000696264
- ☐ Delmarva tariff Kent County – 55007703527
- ☐ Delmarva tariff Sussex County – 55007767456

New (Meter # if available_____Voltage_____Total kW_____)

☐ **Relocation of existing meter/account** (Meter # _____)

☐ **Service Discontinued or Removed Permanently** – Intersection changed to four-way stop, traffic circle
- ☐ Removal of metered service (Meter # _____)
- ☐ Removal from tariff account (please indicate which tariff account for the removal)
  - ☐ Delmarva tariff New Castle County – 55000696264
  - ☐ Delmarva tariff Kent County – 55007703527
  - ☐ Delmarva tariff Sussex County – 355007767456

Requested Service Date:

Requested Point of Service:
Pole #

Connected Electric Load:

Bulbs	Remove Quantity	CIS Bill Code
0-40 W		
Other 250W		
HPS Lighting		

DEL DOT APPLICANT INFORMATION

Print Name:_____ **Signature:** _____

Title:_____ **Phone Number:**_____

Date:_____

Please provide a detailed sketch of the intersection showing:

(a) Existing electrical facilities
(b) Requested point of service
(c) Location of signal facilities
(d) Height of traffic signal poles (this information will be used to determine if proper clearance from electrical facilities may be obtained)
(e) Completed projects should include the Signal I.D. Number or Permit Number on all meter pans, inside and out, to confirm service locations with completed applications.

INFORMATION BELOW FOR ELECTRIC COMPANY USE ONLY:	**INSPECTED AND APPROVED BY STATE OF DELAWARE USE BY:**	**INSPECTED AND APPROVED FOR STATE BY 3RD PARTY (Street Lighting ONLY)**
Name:	Name:	Name:
Date:	Date:	Date: